Development and validation of the Acculturative Stress Scale for mainland Chinese undergraduate students (ASSMCUS) in Hong Kong using Rasch analysis

by

CHEUNG, Kwok Wing

A Thesis Submitted to

The Education University of Hong Kong

in Partial Fulfillment of the Requirement for

the Degree of Doctor of Education

August 2018

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Statement of Originality

I, CHEUNG, Kwok Wing, hereby declare that I am the sole author of the thesis and the material presented in this thesis is my original work except those indicated in the acknowledgement. I further declare that I have followed the University's policies and regulations on Academic Honesty, Copyright and Plagiarism in writing the thesis and no material in this thesis has been submitted for a degree in this or other universities.

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Abstract

The number of mainland Chinese students was 791 (64% of total international students in Hong Kong) in 1996/97 whereas such number went up to 12,037 (73%) in 2016/17—more than fifteenfold increase within 20 years. In particular, mainland China undergraduates (MCU) exhibited a phenomenal growth from 5 in 1996/97 to 6,852 in 2016/17. Nonetheless, few studies have focused on this group of students concerning their acculturative stress and/or mental health in Hong Kong, even though there were several cases of suicide committed by MCU in Hong Kong in the past decade. Completing tertiary education in one's home country is generally not an easy task, and pursuing a university degree in a culturally different and unfamiliar place will surely add to one's difficulties. A literature search of scales assessing acculturative stress showed that none of the existent scales were applicable to MCU in Hong Kong, either because of language issues, different target population, or cross-cultural problems. Hence, the purpose of this study was to develop and validate a suitable scale to measure the acculturative stress of MCU in Hong Kong.

A 172-item pool was created from literature, in-depth and focus group interviews, and then validated in a sample of 274 MCU in Hong Kong using one-parameter Rasch model analysis to produce a 117-item Acculturative Stress Scale for Mainland Chinese Undergraduate Students (ASSMCUS) in 21 dimensions, which are English Barrier: Limited English Proficiency; English Barrier: Limited Colloquial English; Cantonese Barrier: Limited Cantonese Proficiency; Cantonese Barrier: Limited Colloquial Cantonese; Study Stress: Heavy Course Load; Study Stress: Student-Centred Learning Approach; Cultural Difference: Mutual Cultural Misunderstanding; Cultural Difference: Identifying with Hong Kong's Culture and Values; Social Interaction: Loneliness; Social Interaction: Hard to Make Friends with Hong Kong People; Social Interaction: Limited Social Connectedness; Discrimination:

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Negative Attitudes; Discrimination: Feeling Rejected; Discrimination: Stereotypes; Family Responsibility; Homesickness; Career Prospects: Application of Knowledge; Career Prospects: Where to Develop One's Career; Accommodation; Finance; and Life Stress. Empirical findings supported measurement validity of the ASSMCUS in terms of good Rasch item reliabilities, unidimensionality, effective response-category functioning, and absence of gender differential item functioning. The ASSMCUS demonstrated a statistically significant positive correlation with negative affect, and statistically significant negative correlations with positive affect and life satisfaction. Moreover, the ASSMCUS was targeted at a specific place, population, language, level of studies, and cultural background, thus it was culturally appropriate to MCU in Hong Kong. Overall, these results suggested that the ASSMCUS was a reliable and valid instrument to measure acculturative stress within a population of MCU in Hong Kong. Nevertheless, it is the first Chinese scale of acculturative stress developed and validated among a sample of MCU in Hong Kong. Further validation of the scale in the future needs to be conducted to confirm the validity of the scale. In addition, it is better for participants to have a shorter version of the ASSMCUS to reduce their burden to ensure data quality.

(479 words)

Keywords: acculturative stress, Chinese students, scale, undergraduate, Rasch

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of Contents

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

List of Abbreviations

AHSCS	Acculturative Hassles Scale for Chinese Students
ASSCS	Acculturative Stress Scale for Chinese College Students
ASSIS	Acculturative Stress Scale for International Students
ASSMCUS	Acculturative Stress Scale for mainland Chinese undergraduate students
CAS	Chinese Affect Scale
ILS	Index of Life Stress
MCU	mainland China undergraduates
RSAFE	Revised version of Social, Attitudinal, Familial, and Environmental Acculturative Stress Scale-Short Form
SLS	Satisfaction with Life Scale

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

List of Figures

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

List of Tables

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Chapter 1: Introduction

1.1 Background

According to Hong Kong's University Grant Committee's statistics on funded programmes (University Grant Committee, n. d.), the number of students from mainland China was 791 (about 64% of total international students in Hong Kong) in 1996/97 whereas such number went up to 12,037 (about 73%) in 2016/17—more than fifteenfold increase in 20 years (see Table 1.1). Therefore, students from mainland China are a nonnegligible student group in Hong Kong tertiary institutions. In recent years, there has been a demographic change that more students from mainland China are pursuing undergraduate studies, exhibiting a phenomenal growth from 5 in 1996/97 to 6,852 in 2016/17 (see Table 1.1). Nonetheless, few studies have focused on this group of students as to their acculturative stress[1] in Hong Kong.

Table 1.1
Number of students from mainland China enrolled in Hong Kong government-funded university programmes

	1996/97	2016/17
International students	1,238	16,474
Mainland Chinese students	791	12,037
% of mainland Chinese students in international students	63.89%	73.07%
Mainland Chinese undergraduate students	5	6,852
% of mainland Chinese undergraduate students among mainland Chinese students	0.63%	56.92%

Note. Reproduced by the researcher from official data published on the website of University Grants Committee at http://cdcf.ugc.edu.hk/cdcf/searchStatSiteReport.do

[1] Acculturative stress is 'a stress reaction in response to life events' that arise during acculturation (Berry, 2006, p. 294). Acculturation refers to 'the process whereby the attitudes and/or behaviors of persons from one culture are modified as a result of contact with a different culture' (Thomas, 1995, p. 132)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Completing tertiary education in one's home country is generally not an easy task, and pursuing a university degree in a different country will surely add to one's difficulties (Yuan, 2011). As a high-risk group of students for poor mental health (Furnham, 2004; Furnham & Trezise, 1983), they cope with a variety of stresses to adapt to new environments (Mori, 2000) when pursuing their studies in foreign countries, for example, language, accommodation, academic, financial, food, friendship problems (Cheung, 2013; Lin & Yi, 1997; Mori, 2000; Pan, Yue, & Chan, 2010). Many of them develop some sort of negative feelings, including cultural identity crisis, powerlessness, marginalization, inferiority, and loneliness (Sandhu, Portes, & McPhee, 1996, p.16), as well as distress relating to social interaction, social connectedness, social support, and homesickness (Liu, 2009). Even though most international students can settle in the host countries with successful adaptation outcomes (Rosenthal, Russell & Thomson, 2006; Sam, 2001), around 15% to 25% of all international students are gauged to have psychological and psychiatric problems (Leong & Chou, 2002). In a sample of 130 international undergraduate and graduate students attending a university in Utah in the United States for about 2 years, 11.6% of them were reported experiencing acculturative stress (Chavajay & Skowronek, 2008). Recently, a group of 119 Chinese international undergraduate nursing students were reported to have a moderate level of acculturative stress in Australia (He, Lopez, & Leigh, 2012). Hence, mental health is of concern to international students. In Hong Kong, from November 2007 to April 2017, six international students (3 postgraduates and 3 undergraduates including 1 exchange student) from mainland China and two from elsewhere committed suicide (So, 2010; Lo, 2010; To, 2012; "A 21-year-old foreign female student committed suicide," 2017; "城大內地交換生墮樓亡," 2014; "疑不堪感情與學業打擊 21 歲港大內地女生跳樓輕生," 2015), to the best of researcher's knowledge. With such sad losses of precious talents, an understanding of the level of acculturative stress inflicted on international students in Hong Kong, especially

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

students from mainland China, is needed. Other than these extreme and unfortunate cases, some mainland Chinese students may find it difficult to adapt to Hong Kong's academic environment. For instance, one mainland Chinese undergraduate students at the University of Hong Kong relinquished her scholarship place to retake mainland China's National College Entrance Examination in the following year and got admitted to Peking University to study sinology; she decided to leave the University of Hong Kong because she found it difficult to adjust to Hong Kong's humid weather and Cantonese medium of instruction, which might hinder her study (Wu, 2014; "棄港大重讀 遼才女兩膺狀元衝北大," 2014).

Though Hong Kong resembles mainland China very much with respect to cultural heritage such as Chinese festivals, many differences exist between them, resulting in substantial adjustment for mainland Chinese undergraduate students during their sojourns in Hong Kong (Xie, 2009). Firstly, in Hong Kong, the daily spoken language is Cantonese, which is quite different from the spoken language in mainland China—Putonghua (i.e., Mandarin). The form of written Chinese in Hong Kong is traditional Chinese, whereas that in mainland China is simplified Chinese. Secondly, the main medium of instruction in Hong Kong's tertiary institutions and many secondary schools is English, as opposed to Chinese that is the principal teaching language in mainland China. Thirdly, regarding teaching and learning styles, Hong Kong tertiary institutions generally adopt Western models in which students engage in presentations and group/class discussions; by contrast, in mainland China, a class generally operates with teacher-centered instructions: teacher takes full control of the class and its activities, and students usually keep silent and do not have many chances to express themselves in class (Cheung, 2013). Fourthly, in regard to financial issues, Hong Kong was globally ranked first by Mercer LLC. (2016) and second by The Economist Intelligence Unit Limited (2016) respectively in terms of cost of living in 2016. An international student's

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

costs of studying, including tuition fee, living costs and on-campus accommodation, in a Hong Kong's publicly-funded tertiary institution for a regular bachelor's degree in the 2016-17 academic year is roughly estimated to be in the range of US$20,740 to 23,240 (City University of Hong Kong, 2016). Given that the average annual income for a mainland Chinese family in 2012 was US$2,100 (Wong, 2013), the price of Hong Kong's tertiary education is hardly affordable to many ordinary families, unless a middle-school-leaving student can secure a scholarship from Hong Kong's tertiary institutions. To maintain the scholarship as well as meet the high expectation from his/her parents, he/she must attain a good academic performance during his/her studies (So, 2010). Therefore, mainland Chinese undergraduate students in Hong Kong are susceptible to acculturative stress.

In this exploratory study, students from mainland China undertaking undergraduate studies in Hong Kong are of particular interest, because research studies on acculturation issues encountered by mainland Chinese undergraduate students in Hong Kong are very few. Based on a systematic search for empirical articles in online select databases in ProQuest and EBSCOhost (see Appendix 1), only one article about mainland Chinese undergraduate students pursuing teacher education in an education-focused university in Hong Kong was found, but it focuses on their motives and future career intentions. Other articles targeted on mainland Chinese students at either postgraduate level or undergraduate through postgraduate levels as an entire group. Although some research on their acculturation issues has been done on mainland Chinese postgraduate students in Hong Kong (e.g., Zeng & Watkins, 2011), mainland Chinese undergraduate students remain relatively unexplored in that respect. Their acculturation experiences may be different from those of postgraduate students in Hong Kong, in terms of levels of academic study, life experience, and maturity. Therefore, this study would like to fill this void to explore and shed light on the difficulties and challenges

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

encountered by mainland Chinese undergraduate students in the process of acculturation.

With respect to acculturative stress, a first step to help mainland Chinese undergraduate students is to develop a culturally sensitive measurement instrument to assess their stress levels. A systematic search on acculturative stress scale for international students, especially mainland Chinese students in Hong Kong (see Appendix 2) revealed that no extant scales have been designed for mainland Chinese undergraduate students in Hong Kong. Many acculturative stress scales were developed in the United States, except one in Hong Kong (i.e., Pan, Yue, & Chan, 2010). However, the target participants of Pan, Yue, & Chan (2010) were mainland Chinese postgraduates, rather than undergraduates.

1.2 Aim and objectives

It was against this backdrop that the current study was aimed at developing and validating a culturally competent acculturative stress scale for mainland Chinese students pursuing their undergraduate studies in Hong Kong to assess whether they were under excess acculturative stress. To achieve this aim, the research objectives were to identify the stress factors influencing their acculturative stress, set up an item pool, and construct a valid scale to measure their acculturative stress.

1.3 Research question

Considering the aim and objectives, a research question was derived as follows:

> Given the probable acculturative stress experienced by mainland Chinese undergraduate students in Hong Kong, can a scale be constructed to rank individuals along a continuum of acculturative stress?

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

To help answer the above research question, the following sub-questions needed to be addressed:

1. Does the scale exhibit unidimensionality?
2. Do the items fit the Rasch model well?
3. Does the rating scale work well?
4. Do the items exhibit differential item functioning (DIF)?
5. Do the values of person and item reliability and separation indicate adequate psychometric properties for the scale?
6. Do the items exhibit sensible item hierarchies?
7. Does the scale have a good targeting?
8. Does the scale attain convergent validity?

1.4 Significance and/or impact of this study

This study imparts information about the acculturative stress of mainland Chinese undergraduate students in Hong Kong, and adds new knowledge to the discipline of acculturation. Findings of this study not only provide an original measurement scale to assess mainland Chinese undergraduate's acculturative stress, but also probably help improve the practice of counselling, and assist counsellors design apposite and more effective intervention and acculturation programs, which could in turn enhance these international students' well-being.

Many previous scales measuring acculturative stress of international students may not be completely applicable to this study, because of the United States rather than Hong Kong context, questionnaire in English rather than Chinese, Chinese research graduate rather than undergraduate students, Chinese undergraduate and postgraduate students as a whole rather

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

than sole undergraduate students. The proposed scale in this study was an acculturative stress scale for mainland Chinese undergraduates in Hong Kong context and could be considered innovative since no such scale is available yet. Also, this study was intended to address whether domains of financial concerns, perceived discrimination, and cultural differences should be included in this proposed scale, because the inclusion of these domains in previous studies was inconsistent. Last but not least, many previous scales were obtained by means of factorial methods in classical test theory. This study adopted Rasch analysis, a modern measurement method, to construct an instrument to measure acculturative stress by transforming ordinal scores into interval measure.

Practically, the scale may be used as a diagnostic tool by mental health practitioners, counsellors of student affairs, educational psychologists and as a self-assessment tool by mainland Chinese undergraduates in Hong Kong. Also, when the essential factors giving rise to their acculturative stress are identified, governments and tertiary institutions can take appropriate measures to reduce the negative effects of these factors, and thus enhancing these international students' well-being.

1.5 Scope of this study

This study only included students from mainland China pursuing full-time bachelor's degrees in Hong Kong's government-funded and private tertiary institutions, and excluded those from Macau, and Taiwan. This study focused on their acculturative stress arising from acculturation process in Hong Kong. In-depth interviews and focus group interviews as well as online survey were carried out to collect qualitative and quantitative data.

1.6 Methodology

To achieve the above aim and objectives, and address the research questions and sub-

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

questions, the following procedures were conducted:

1. Search literature, and existing scales relevant to acculturative stress of international students and mainland Chinese students. On this basis, compile an item pool of acculturative stress that is relevant to mainland Chinese student sojourners.
2. Conduct in-depth interviews with some mainland Chinese undergraduates in Hong Kong to identify any missing item or dimension that had not been covered by the item pool. After analysing the findings from these interviews, update the item pool and produce an initial questionnaire.
3. Carry out a pilot test of the initial questionnaire with another groups of mainland Chinese undergraduates in Hong Kong. Afterwards, conduct a focus group discussion with them to fine-tune the initial questionnaire to come up with an online survey, which included the final questionnaire and criterion measurements.
4. Distribute the online survey to target participants to collect data.
5. After data collection, evaluate the psychometric properties of the scale using Rasch method, and examine convergent validity of the scale.

1.7 Structure of this thesis

This thesis was organized into 5 chapters. This Chapter 1 gives the background of this research, aim and objectives, research questions, significance and/or impact of the proposed study, scope of this research, methodology, structure of this thesis, and definition of terms. Chapter 2 reviews literature on major theories of stress and acculturative stress, and instruments measuring acculturative stress. Chapter 3 is about the methodology of this study covering research design, sampling and size, instrumentation, ethical issues, tools for data analysis, and principles of data analysis. Chapter 4 presents the analyses and results. Chapter 5 covers the discussion and conclusion.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

1.8 Definition of terms

The following terms were used in this study. In order to facilitate readability, their meanings were given as follows:

Acculturation

From a psychological perspective, acculturation refers to the process by which an individual experiences cultural changes across various life domains such as language, ethnic identification, and affective expression arising from continuous contact with another culture.

Acculturative stress

The concept of "acculturative" in the term "acculturative stress" comes from acculturation. Acculturative stress is the stress resulting from the process of acculturation, in which there are interactions among acculturative stressors, cognitive appraisal and coping, outcome, and emotions. In this way, acculturative stress is a stress reaction in response to acculturative stressors that come up during acculturation. In other words, acculturative stress is a physiological and psychological state brought about by acculturative stressors rooted in the process of acculturation (Berry, Kim, Minde, & Mok, 1987). These acculturative stressors are culture-specific, encompassing social, familial, and environmental stressors as well as perceived difficulties across various culture-specific life domains such as language, education, work, and intercultural interactions.

There are times and situations in which the cultural changes can be stressful to an acculturating individual. Nevertheless, acculturation does not necessarily result in negative emotions, i.e., negative stress reactions; for instance, rising to a challenge may give a sojourner's personal satisfaction. Many factors moderate the level of acculturative stress

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

such as cultural distance between home and host countries, social support, length of stay in host country, etc. For example, the more social and family support, the lower a sojourner's level of acculturative stress in host country.

International student

International students refer to students enrolled at an institution of higher education in a country or territory, e.g., Hong Kong, of which he/she is not a permanent resident (UNESCO, 1971, p. 9).

Mainland Chinese undergraduate students

Mainland Chinese undergraduate students refer to students from mainland China pursuing bachelor's degrees in Hong Kong's government-funded and private tertiary institutions. Chinese students from Macau and Taiwan are excluded.

Stress

There are many definitions of stress. Under stimulus-based category, stress can be defined as either a situational stimulus or life events impinging on a person, whereas under response-based category, stress can be defined as a person's psychological or physiological response to stressfully situational stimuli. Another group of definitions of stress is psychological category, one of which is Lazarus and Folkman's (1984) transactional model of stress and coping, an often cited and widely used stress model; in such model, stress was defined as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p. 19). In this proposed study, the above Lazarus and Folkman's (1984) definition is adopted, because this definition recognizes that stress is the product of the person's subjective

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

perception of imbalance between environment's objective demands on him/her and his/her coping resources. Also, this definition of stress overcome the common weakness of stimulus-based and response-based categories of stress definitions, which treat an individual like a machine to objectively convert the environmental stimulus into biological/psychological response, and largely ignore the individual differences toward the stimulus as well as the interactions between the individual and his/her various environments.

In this study, stress is conceptualized to cover both stressors and responses to stressors, which are process components of stress, since stress is a process of interaction between stressors (i.e., events or transactions between the person and the environment), cognitive appraisal and coping, outcome, and emotions. Therefore, items in survey can be stressors or responses to stressors. The stressors are the ones being appraised (i.e., perceived) to be either harmful, threatening, or challenging by the concerned individual.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Chapter 2: Literature Review

2.1 Acculturation

Originally, sociologists and anthropologists studied acculturation with a keen focus on cultural/group level changes arising from acculturation (van de Vijver & Phalet, 2004). Redfield, Linton, and Herskovits (1936) defined that "acculturation comprehends those phenomena, which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original cultural patterns of either or both groups" (p.149). Acculturation at cultural/group level denote a cultural group's collective changes such as social benefits, political ideology, and economic policy (Matsudaira, 2006).

By contrast, social psychologists studied acculturation at psychological/individual level (Rudmin, 2003). Graves (1967) coined the term, psychological acculturation, to differentiate between individual/psychological-level changes due to acculturation from those occurring at the group/cultural level. Psychological acculturation denotes an individual's changes in manners, value judgements, and identities during acculturation process (Graves, 1967).

Figure 2.1 depicts a framework connecting cultural/group level and psychological/individual level acculturation (Berry, 2003, p. 20). The original culture groups A and B, and the resulting cultural changes in both groups A and B after coming into contact impact individuals in both groups A and B to undergo psychological acculturation to lead to eventual adaptation to their new situations.

At the cultural/group level (on the left), two original cultural groups (A and B) come into contact, and interact to result in major (e.g., loss of an ancestral language in a cultural group)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

or minor (e.g., adoption of the other cultural group's language being one of the official languages in a culture group) changes in attitudinal reaction (e.g., prejudice and discrimination), politics (e.g., multicultural policy development), economy (e.g., foreign workers), demography (e.g., population expansion), and cultures (e.g., cultural diversity) of each cultural group.

At the psychological/individual level (on the right), psychological acculturation affects individuals' behavioral changes in both cultures A and B such as changes in manners, thoughts, attitudes, cognitions, personalities, languages, values, and orientations of human relationships. Some of these behavioral changes are easily attained, e.g., ways of dressing, and eating. Nevertheless, if attainment cannot be made, these changes can be problematic, producing excessive stress, i.e., acculturative stress, such as anxiety and depression. Adaptation can be either psychological (e.g., sense of self-satisfaction) or sociocultural, relating the individual to others in the new culture group (e.g., using host language competently in everyday life; Searle & Ward, 1990; Ward, Bochner, & Furnham, 2005; Ward & Kennedy, 1992).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

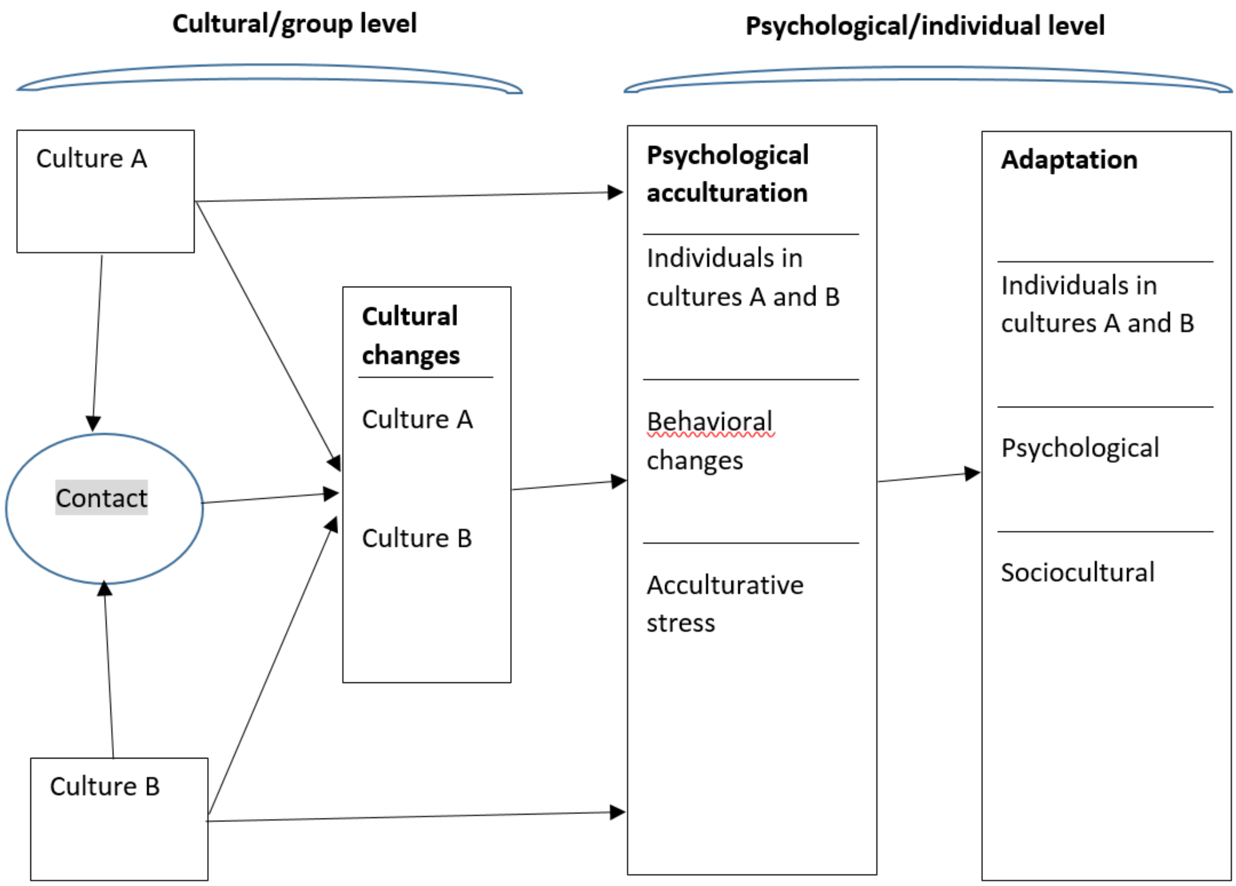

Figure 2.1. A framework for conceptualizing acculturation (Berry, 2003, p. 20).

Making the differentiation between cultural/group level and psychological/individual level acculturation is essential for two reasons. First, the degree to which the groups and individuals experience acculturation could differ. Second, there are big individual differences in the psychological characteristics being brought to the acculturation process, and each individual coming from the same culture group does not necessarily acculturate to the new culture at the same rate or to the same extent, even though all of them dwell in the same acculturative place (Berry, 2003; Berry, Poortinga, Breugelmans, Chasiotis, & Sam, 2011). Since the aim of this study is to develop a measurement scale to assess acculturative stress of individual mainland Chinese students pursuing undergraduate studies in Hong Kong, the psychological/individual level of acculturation is much considered in this study.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Theoretically, each culture group could equally exert influence on one another. However, pragmatically, one tends to dominate the other, resulting in dominant and non-dominant groups (Berry, Poortinga, Breugelmans, Chasiotis, & Sam, 2011). The present study is about the mainland Chinese undergraduate students in Hong Kong. Since they are the minority in Hong Kong, it goes with saying that Hong Kong culture is the dominate one, whereas the mainland Chinese culture brought by them is the non-dominant one.

The conceptualization of acculturative stress is guided by a general discussion of stress. Therefore, stress is discussed below first, followed by acculturative stress.

2.2 Stress

The definitions of stress are many and vary widely (Goodnite, 2014). For instance, Sommerville and Langford (1994) opined that "stress is a societal problem which has significant ramifications in terms of the health and well-being, prosperity, and productivity of the individual and also for the organization within which he/she is employed" (p. 234). Schlebusch (2004) defined stress as "a multifaceted construct encompassing a person's physiological, psychological and behavioural responses when seeking to adapt and/or adjust to internal and/or external pressures or demands associated with change and its perception" (pp. 327-328). Benson and Stuart (1992) remarked that "stress is the perception of a threat to one's physical or psychological wellbeing and the perception that one is unable to cope with that threat" (p. 180). Generally, these definitions of stress fall into one of the three categories: stimulus-based, response-based, and psychological (Beehr & Franz, 1987; Cox & Griffiths, 2010; Kalsi, 2013; Pan, 2008; Wincott, 1986). The former two are dated categories, whereas the latter one is the contemporary category.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2.2.1 Stimulus-based category

Stress is viewed as a situational/environmental stimulus (Cox, 1993; Nikolaou & Tsaousis, 2002) or life event (Holmes & Rahe, 1967) impinging on a person. This category of definitions adopts the 'engineering approach' (Cox, 1993, p. 8) to draw an analogy between stress and a load/demand (i.e., an external force) applied to a physical object to cause a strain to probably result in its deformation (Smith, 1987). In physics, Hooke's law (2012) of elasticity states that a physical object can restore to its original state when a load/demand being exerted on it is taken away, provided that the strain is within its elastic limits. By analogy, a person can stand stress up to a threshold, beyond which either physiological or psychological symptoms/breakdown will come about; moreover, like different physical objects, different people have different thresholds of breakdown. A major weakness of this category is to consider stress to be equivalent to the stressor, which is the source of stress, resulting in a confusion about stress and stressor (Li, 2002; Pan, 2008).

2.2.2 Response-based category

Stress is treated as a person's psychological or physiological response to stressfully environmental/situational stimuli (Nikolaou & Tsaousis, 2002). For instance, an influential pioneer in stress research and endocrinologist, Selye (1976) referred to the "the non-specific response to any demand, including efforts to cope with the wear and tear in the body caused by life at any one time" (p. 398) as stress, and introduced the General Adaptation Syndrome (Selye, 1936, p. 32; GAS) concept to characterize "the sum of these non-specific adaptive reactions" (Selye, 1946, p. 119) to stressful stimuli by three stages: alarm, resistance, and exhaustion. "Non-specific" means a set of commonly shared and predictable pattern of biological responses, irrespective of the stressor's nature ("Hans Selye's General Adaptation Syndrome," n. d.; Goldstein & Kopin, 2007; Selye, 1946). In the alarm stage, an

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

individual's body initially identifies a stressor, and runs into a response of "labouring, running or fighting" (Cannon, 1929, pp. 422-423) by discharging blood sugar and appropriate hormones to provide instant energy to remove the stressor; if the stressor lingers, the individual enters into the resistance stage (or called adaptation stage), and the body starts to adapt to the stressor in order to minimize the effect of the stressor; in the exhaustion stage, should the stressor persist beyond the coping capacity of the individual's body for a long time, the body's ability to resist the stressor gradually subsides and eventually collapses, resulting in long-term bodily harm and/or illness ("General Adaptation Syndrome," n. d.). The drawback of GAS lies in its restricted concepts on the physiological stressors, processes and responses without much considering psychological ones, because an individual's personality and perceptions of a stressor as well as the stressor's characteristics greatly affect the response of an individual to the stressor (Lazarus & Folkman, 1984). Moreover, critical comments on the validity of the non-specificity of biological response in GAS arises; Mason (1971, 1975) conducted experiments to demonstrate that the non-specificity of the physiological response to nocuous stimuli was not entirely consistent with what GAS described, because the presence of psychological stimuli, e.g., emotional discomfort or pain, in many experiments on physical stressors, e.g., heat, and cold was previously ignored; in other words, GAS cannot categorically claim that the non-specificity of biological response is solely elicited by physical stressors.

The common weakness of the stimulus-based and response-based categories is that both are conceptually founded upon a 'stimulus-response paradigm' with an individual being treated like a machine to convert the environmental stimulus into biological response, and largely ignore the interactions between an individual and his/her various environments as well as an individual's perceptual and cognitive processes (Cox, 1993, p. 11).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2.2.3 Psychological category

To overcome the shortcomings of stimulus-based and response-based categories, psychological category is characterized by six things: first, an interaction between an individual and the environment is much considered; second, an individual is assumed to take up a more active role in that interaction which calls for explanation based on a number of psychological processes, such as perception, cognition, and emotion; third, individual differences and how they affect stress reaction are taken into consideration in the stress process; fourth, stress is treated as “a negative (unpleasant) emotional experience which occurs when individuals perceive themselves to be subject to excessive demands, or demands with which they cannot cope” (Cox & Griffiths, 2010, pp. 36-37); fifth, ways to cope with stress and how coping could mediate or moderate the effects of stress on states of health are investigated; sixth, stressful stimulus and response are included in this category of definitions from the encounter of a stressful stimulus in the situation/environment to the psychological and physiological changes in the individual’s body in response to the stressful stimulus (Cox & Griffiths, 2010; Cox & Ferguson, 1991).

Two subtly different sub-categories of psychological definitions identified, interactional (structural) and transactional (process), look alike, but differ in where they lay emphasis on the relationship between the individual and the environment (Cox & Griffiths, 2010). Received much contribution from social epidemiology, the interactional definitions concentrate on the structure of the individuals’ interactions with their environment; whereas drawing great input from clinical and social psychology, the transactional definitions focus on the individuals’ psychological processes behind their interactions with environment (Cox & Griffiths, 2005; Cox & Griffiths, 2010).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2.2.3.1 Interactional sub-category

This sub-category of definitions views stress as a relationship (or “statistical interaction”) between stressors and responses (Cooper, Dewe, & O’Driscoll, 2001, p. 11; Mazzetti, 2014). It focuses on cause and effect and the interaction between stressors, such as workload, and responses, such as anxiety; moderators are commonly used to account for the individual difference, e.g., an individual’s attributes, or for environmental context, e.g., social support available to an individual in that environment (Mazzetti, 2014). Greater emphasis is put on the “architecture” (i.e., structures, attributes) of the environments/situations that cause an individual’s stress than processes involved and how the individual copes with the stress (Cox & Griffiths, 2010, p. 37). Structures denote “the relatively stable arrangements of things”, and processes refer to “what structures do and how they change” (Lazarus, 1999, p. 13). This category is described as “structural” and “quantitative” because a stressor is often hypothesized to correlate with a response (Cooper, Dewe, & O’Driscoll, 2001, p. 11). The weakness of this sub-category is that it is basically static and limited, due to the “structural manipulations” by varying a third variable (a moderator) on the interaction between the stressor and response to explain the complexity of their relationship; such an explanation of the relationship does not detail the stress process, because empirical findings usually reveal a moderator effect only but do not elucidate the role that the moderator takes up in the stress process (Cooper, Dewe, & O’Driscoll, 2001, p. 11).

A number of models, and variants thereof, have been developed within the category of interactional definitions (Cox & Griffiths, 2010). It is not possible to survey them all. The main and most recent models are person-environment fit model (Caplan, 1987; Edwards, Caplan, & van Harrison, 1998), job demand-control model (Karasek, 1979), demand-control-support model (Johnson & Hall, 1988), and effort-reward imbalance model (1996).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2.2.3.2 Transactional sub-category

Being primarily concerned with cognitive appraisal, emotion and coping, transactional sub-category of stress emerged likely through the development, testing, and application of the interactional sub-category of stress, largely consistent with it (Cox & Griffiths, 2005; Cox & Griffiths, 2010). Transactional sub-category of stress explicates the stress process, in which the person's experience of demands, control, and social support within the environment causes his/her experience of stress, reactions to it as well as efforts to cope with it, and impacts on his/her behavior and health (Cox & Griffiths, 2010).

Unlike interactional sub-category that focuses on the structures of a person's interaction with his or her environments, transactional sub-category lay great emphasis on the dynamics of the psychological mechanisms of his or her cognitive appraisal and coping during a stressful event (Cooper, Dewe, & O'Driscoll, 2001). Fundamental to this sub-category is the possible imbalance between demands and ability or competence; that is, if a person's perceived demands exceed his or her perceived capability, the experience of stress will arise (Hassard & Cox, 2015). Stressful experience is taken as a person-environment transaction (Glanz & Schwartz, 2008). The term "transaction" means that stress does not reside in a person or an environment, but rather "reflects the conjunction of a person with certain motives and beliefs (personal agendas, as it were) with an environment whose characteristics pose harm, threats or challenges depending on these personal characteristics" (Lazarus, 1990, p. 3). In other words, stress is not a factor within the person or environment, but exists throughout a continuing process that involves a person transacting with his or her environment, appraising or evaluating those stressful issues, and trying to cope with them when stressful matters come along (Cooper, Dewe, & O'Driscoll, 2001). Transaction also means "process", in which the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

interaction between the two is very dynamic, rather than static, owing to the ongoing interplay between the person and environment (Lazarus, 1990). That is, his or her perception could change over time even in the same environment (Hassard & Cox, 2015).

An often-cited, widely used and seminal transaction model is Lazarus and Folkman's (1984) transactional model of stress and coping (Goh, Sawang, & Oei, 2010; Pan, 2008). Another one is Cox and Mackay's transactional model of stress (in Cox, 1978, p. 19), especially in the literature of work stress. These two models resemble each other closely in terms of the processes and stages (Mark & Smith, 2008). As depicted in Figure 2.2, Cox and Mackay's transactional model of stress considers stress to be part of a complex and dynamic system of transaction between the person and his or her environment, and to be an individual perceptual phenomenon derived from psychological processes. Equipped with a feedback mechanism, such a non-linear and cyclical system has five stages (Cox, 1978):

- The first stage stands for the sources of demand on a person and reflects the features of their environment. There are two types of demand. External demand is a factor of the person's external environment, whereas internal demand refers to meeting the person's psychological and physiological needs.
- The second stage denotes the person's primary appraisal, that is, the person's perception of the demand and of his or her ability to cope with the demand. The person will feel stressed out if there is a personally critical imbalance or mismatch between the perceived demand and the perceived capability to cope with that demand. Such personal perceptions rely much on the individual's personality, which could differ from person to person.
- The third stage represents the response to stress, including secondary appraisal with respect to the methods of coping available to the person. As mentioned above, the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

personally marked imbalance results in the subjectively emotional experience of stress (e.g., mood change), which in turn leads to both psychological and physiological responses. Cognitive defence and change in behavior, i.e., coping, are adopted to alleviate the stressful effect of the demand.

- The fourth stage is concerned with the consequences of coping.
- The fifth stage is the general feedback and feedforward, which take place at all other stages in the stress system, and help shape the outcome at each stage (pp. 18-20)

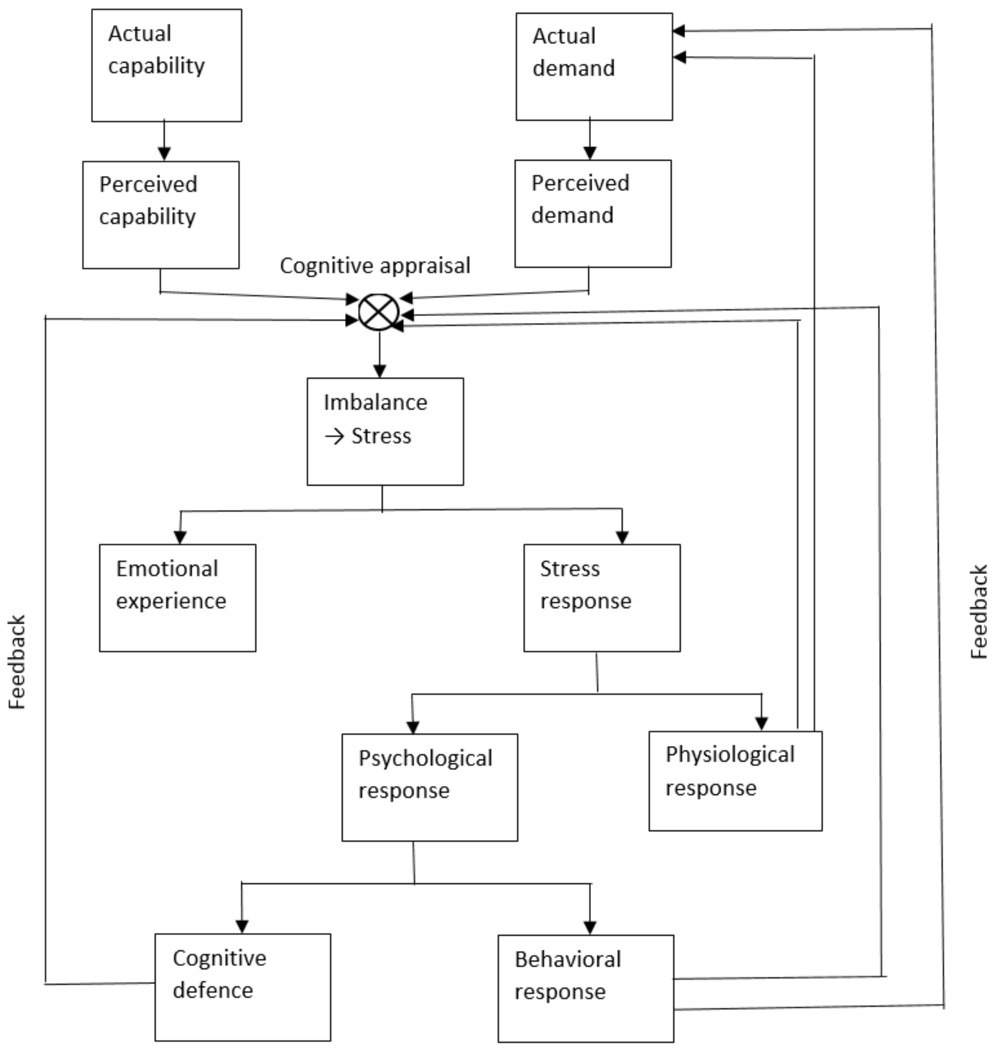

Figure 2.2. Cox and Mackay’s transactional model of stress (in Cox, 1978, p. 19)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Lazarus and Folkman (1984) developed a process-oriented and relational transaction model to stress and coping responses. The model is process-oriented because it presumes the person and environment are in a “dynamic and reciprocal relationship” (Schneider & Hammitt, 1995, p. 226); the model is relational inasmuch as stress is defined as “a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being” (Lazarus & Folkman, 1984, p.19). This definition of stress shows the prime importance of the relationship (or interaction) between the person and the environment, and takes into consideration of both characteristics of the person and the nature of the environment. The evaluation as to whether a particular person-environment relationship is stressful depends on the person’s cognitive appraisal, rather than the objective environment. Subject to his or her ongoing cognitive appraisal and ways of coping, the personal-environment relationship/interaction (i.e., stress) is ever changing at different times within an encounter or across a variety of encounters. Therefore, cognitive appraisal, and coping are all viewed as dynamic mediating processes, rather than static states, to regulate between the causal antecedents and outcomes (i.e. immediate and long-term effects) of stress. Figure 2.3 is a theoretical schematization of Lazarus and Folkman’s (1984) transactional model of stress, coping, and adaptation (p. 305) with three essential groups:

1. causal antecedents, i.e., person and environment variables as;
2. mediating processes and components, i.e., ongoing processes of stress in different times of each stressful encounter, and each process of stress consisting of two main components: appraising, and ways of coping
3. adaptational outcomes both for immediate (i.e., short-term) effects and long-term effects.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

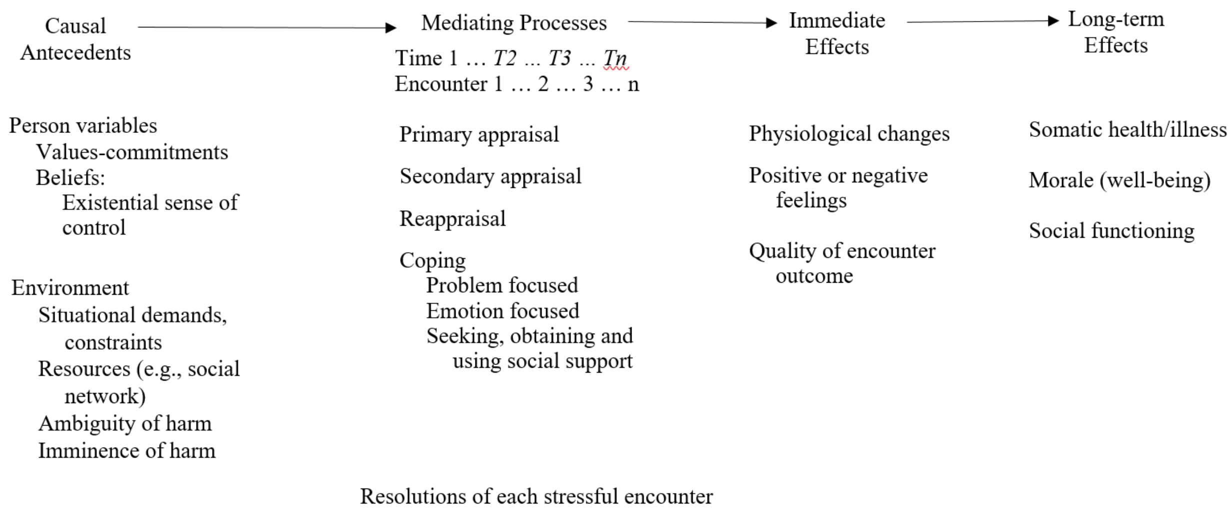

Figure 2.3. A theoretical schematization of Lazarus and Folkman’s (1984) transactional model of stress, coping, and adaptation (p. 305)

Their model proposes that there are antecedents leading to stress and coping appraisals by a person. These antecedents are person factors affecting appraisal and environment factors affecting appraisal. The person factors include, but are not limited to, value judgements based on personal experiences and cultural background, for instance, commitments which “express what is important to the person, what has meaning for him or her” (Lazarus & Folkman, 1984, p. 56); and beliefs which “determine how a person evaluates what is happening or is about to happen” (Lazarus & Folkman, 1984, p. 80), for example, existential sense of control that concerns “a person’s feelings of mastery and confidence” (Lazarus & Folkman, 1984, p. 66). Lazarus opined that among these factors, goal commitment is the most crucial one because “it implies that a person will strive hard to attain the goal” and that “if there is no goal commitment, there is nothing of adaptational importance at stake in an encounter to arouse a stress reaction’’ (Lazarus, 1999, p. 76). Values and beliefs are likely “to be weaker factors as influences on actions or reactions than goal commitments”, for a person can have values and beliefs “without ever acting on them”; for instance, having wealth

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

is good, but not worth making a strong commitment to acquire it (Lazarus, 1999, p. 75-76). The environmental factors comprise, but are not limited to, situational demands which are composed of "implicit and explicit pressures from the social environment to act in certain ways and manifest socially correct attitudes" (Lazarus, 1999, p. 61); situational constraints stipulating "what people should not do, which are also backed up by punishment if violated" (Lazarus, 1999, p. 62); environmental resources which a person can "draw upon to survive and flourish" (Lazarus & Folkman, 1984, p. 243), for instance, social network that can help reduce the risk of "many physical and psychological" issues (Lazarus & Folkman, 1984, p. 247); ambiguity of harm which can either intensify or reduce threat of harm, depending on a person's level of tolerance for ambiguity and his or her anticipation of harm (Lazarus & Folkman, 1984, p. 106); and a more imminence of harm leads to a "more urgent and intense" appraisal (Lazarus & Folkman, 1984, p. 115), which could affect the "quality of decision making" as a thorough search for and evaluation of information and advice may not be feasible (Lazarus & Folkman, 1984, p. 93). Under the influence of person and environment variables, a person evaluates an encounter using three types of cognitive appraisal: "primary, secondary, and reappraisal" (Lazarus & Folkman, 1984, p. 53).

Primary appraisal is a judgement about whether "an encounter is irrelevant, benign-positive, or stressful" (Lazarus & Folkman, 1984, p. 53):

- when the person perceives the encounter not to have any impact on his or her well-being, the encounter is appraised to an irrelevant one;
- when the person assesses that the encounter's outcome can maintain or even enhance his or her well-being, the encounter is appraised to be a benign-positive one which is characterized by pleasurable emotions such as satisfaction or joy; and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

- when the person appraises that the encounter has harm/loss, threat, or challenge, it is considered to be stressful:
  - ❖ harm/loss denotes that actual damage to the person has already happened;
  - ❖ threat concerns potential/anticipated harms or losses which are characterized by negative emotions such as anxiety; and
  - ❖ challenge refers to the encounter that holds potential for gain, growth or benefit which is characterized by pleasurable emotions (Lazarus & Folkman, 1984). However, if there is no threat in the perception of challenge, the encounter is not considered to be stressful (Lyon, 2012) but benign-positive.

Hence, stress is understood as an outcome of a primary appraisal of an encounter which poses either immediate harm/loss, a threat of future harm/loss, or challenge that could give rise to opportunities for potential gain as well as risks of threat (Miller & McCool, 2003).

Secondary appraisal is triggered by the perception of threat (Lyon, 2012) in primary appraisal, and is a judgment on "what might and can be done" (Lazarus & Folkman, 1984, p. 53). It evaluates what available coping strategies can be effectively applied to tackle the threat, and the consequences of using such coping strategy/strategies (Lazarus & Folkman, 1984).

Coping is defined as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984, p. 141). This definition underscores five characteristics of coping as follows:

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

1. as reflected in the words “constantly changing”, coping is deemed to be a process-oriented, rather than trait-oriented, phenomenon, which contains both cognitive and behavioral elements;
2. as indicated in the word “specific”, coping is context-specific since a person will adjust his or her cognitive and behavioral efforts to meet the particular stressful encounter;
3. in contrast to automatized adaptive behaviors and thoughts which requires no effort, coping involves what a person does or thinks, no matter whether the outcome of the acts or thoughts is good or bad;
4. the word “manage” does not mean mastery. Managing encompasses a person’s efforts to minimize, evade, endure, modify, or accept the stressful conditions as well as his or her attempts to master or handle the environment (Lazarus & Folkman, 1984, pp. 141-142); and
5. coping process is initiated in response to primary appraisal, in which the person’s values, goal commitment, and/or well-being are threatened.

There are two coping strategies: “problem-focused”, and “emotion-focused” (Lazarus & Folkman, 1984, p. 179). Like problem-solving strategies concentrating mainly on the environment, problem-focused coping strategies are directed outward to manage or change the problem with the distress-producing environment such as “defining the problem, generating alternative solutions, weighting the alternatives in terms of their costs and benefits, choosing among them and acting” (Lazarus & Folkman, 1984, p. 152). However, problem-focused coping strategies are also directed inward (i.e., “directed at the self”) in terms of a person’s “motivational or cognitive changes” such as “shifting the level of aspiration, reducing ego involvement, finding alternative

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

channels of gratification, developing new standards of behavior, or learning new skills and procedures” (Lazarus & Folkman, 1984, p. 152).

Emotional-focused coping strategies are directed at reducing emotional distress (Lyon, 2012), or “regulating the emotional response to the problem” (Lazarus & Folkman, 1984, p. 179) such as avoidance, meditation, selective attention, blaming, wishful thinking, venting anger, having a drink, distancing, seeking emotional support, and wresting positive value from negative events (Lazarus & Folkman, 1984; Lyon, 2012). Unlike problem-focused coping strategies, emotional-focused coping strategies do not directly change the meaning of an encounter, for example, activity like meditating may assist a person reappraise the meaning of an encounter without distorting the reality, but has nothing to do with directly changing the meaning of the encounter (Lyon, 2012).

Reappraisal is “a changed appraisal based on new information from the environment and/or the person” (Lazarus & Folkman, 1984, p. 53). It is a “process of continually evaluating, changing, or relabeling earlier primary or secondary appraisals” (Lyon, 2012, p. 9) as well as the outcome of “cognitive coping efforts” (Lazarus & Folkman, 1984, p. 53), when the encounter unfolds.

Though no feedback loops are shown in Figure 2.3, the theoretical schematization of Lazarus and Folkman’s (1984) transactional model of stress, coping, and adaptation is dynamic in a sense that processes of appraisal and coping are ever changing, and “recursive” because immediate or long-term effects resulting from coping process can impact antecedent causal variables, depending on where the encounters start and finish, for instance, effects like negative feelings can, themselves, be stressors (Lazarus & Folkman, 1986, p. 72).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Conceptualized as immediate and long-term effects (Lyon, 2012), adaptational (or adaptational health) outcomes which are shaped by appraisal and coping processes have three basic types: "somatic health", "morale or life satisfaction", and "functioning in work and social living" (Lazarus & Folkman, 1984, p. 181). Immediate effects comprise physiological changes, positive or negative feelings, and quality of encounter outcome. Physiological changes may include, but are not limited to, "elevated blood pressure, elevated serum cholesterol, and compromised immune system functioning" (Edwards, Caplan, & Harrison, 1998, p. 30). Examples of positive or negative feelings may be happiness, felicity, anxiety, or dysphoria. Quality of encounter outcome concerns whether "the situation [is] improved, the same, or worse" (Lazarus & Folkman, 1987, p. 156).

Long-term effects include somatic health/illness, morale (well-being), and social functioning. Such somatic health/illness (i.e., a person's physical health/illness) as hypertension or even coronary heart disease may come about when the experiences of physiological changes like elevated blood pressure accumulate over time (Edwards, Caplan, & Harrison, 1998). Morale deals with "how people feel about themselves and their conditions of life" (Lazarus & Folkman, 1984, p. 194). The cumulative experiences of positive feelings like happiness at work or negative feelings like anxiety over time can result in high morale such as work satisfaction or low morale such as chronic depression respectively (Edwards, Caplan, & Harrison, 1998). Social functioning is referred to as "the ways the individual fulfills his or her various roles, as satisfaction with interpersonal relationships, or in terms of the skills necessary for maintaining roles and relationships", and "is an extension of coping effectiveness in many specific encounters over the life course" (Lazarus & Folkman, 1984, p. 223). Coping effectiveness is defined as the "fit or misfit" between what the individual does

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and his or her available coping options (Lazarus, 1991a, p. 412). Hence, coping effectiveness indicates quality of encounter outcome. As such, the cumulative experiences of poor quality of encounter outcome in the course of time may lead to a bad social functioning. Conversely, sustained good experiences of good quality of encounter outcome may produce good social functioning.

In 1999, Lazarus added to and changed the model depicted in Figure 2.3 slightly to make it more complete after years of afterthoughts to give a revised model in Figure 2.4, based on “a broader, more complex, and richer rubric—namely, emotion” (Lazarus, 2000, p. 230). Emotion was defined as “an organized psychophysiological reaction to ongoing relationships with the environment, most often, but not always, interpersonal or social”, and appraisals of the personal significance for well-being mediate between the continuous person-environment relationships and the psychophysiological reactions to these relationships throughout the adaptational process (Lazarus, 2000, p. 230). Like psychological stress, emotion has to do with “person variables, such as personal values, goals, goal hierarchies, belief systems, and personal resources as well as social (environmental) events of importance” (Lazarus, 1999, p. 91). Lazarus (1993) claimed that psychological stress should be “part of a larger topic, the emotions” (p. 10) for four reasons. First, psychological stress theory is equivalent to a theory of emotion (Lazarus, 1993). Stress and emotions have more things in common than difference “in the way these embodied states of mind are aroused, coped with, and how they affect psychological well-being, functioning, and somatic health” (Lazarus, 1999, p. 36). Second, either as a “unidimensional” concept—that is, as a continuum ranging from low to high, or with only a few functional categories, stress only renders relatively little information about a person’s struggle to adapt when compared with emotion, which has 15 or even more different types to enrich the description and analysis of his or her adaptation struggle, and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

provide a fairly comprehensive picture of and clinical insight about the dynamics his or her life adaptation (Lazarus, 1999, pp. 32-34). The 15 emotions are "anger, envy, jealously, anxiety, fright, guilt, shame, relief, hope, sadness, happiness, pride, love, gratitude, and compassion", each of which not only reveals something different about how the person appraises an encounter, and how he or she copes with it, but also exhibits a different story about his or her continuous person-environment relationship (Lazarus, 1999, p. 34). Third, knowing what emotion being experienced by a person, and his or her appraisal and coping processes of the person-environment relationship may uncover a stable feature of his or her emotional life. For instance, if a person repeatedly reacts in numerous encounters with the same emotion, e.g., envy, jealousy, or pride, he or she is evidently bound to be an envious, jealous, or proud person. Hence, a person's emotional response, to a certain extent, "transcend" the situational context, and reflects his or her "personality trait" (Lazarus, 1999, pp. 34-35). Fourth, stress always goes with emotion, but not vice versa (Lazarus, 1999, p. 35). Emotions such as anger, fright, and sadness (these could be called "stress emotions") and are derived from stressful encounters, i.e., "harmful, threatening, or challenging conditions" (Lazarus, 1999, p. 36). However, arising from a person's favorable appraisal of circumstances and coping, emotions like happiness, pride, or gratitude which are "positively toned" may or may not be associated with stress; for instance, when a person feels happy about making a profit from sale of an investment product that has occurred, he or she may not necessarily have a nasty fright that the favorable conditions engendering his or her happiness will fizzle out soon (Lazarus, 1999, pp. 36-37).

As stress was conjoined with emotions, research focus has shifted from stress to emotions. The concept of appraisal was expanded beyond perceptions of threat, harm, and challenge to include evaluation of benefit perception in order to cover both "negatively toned emotions

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

that flow from stress", and "positively toned emotions" (Lazarus, 1999, p. 91). Appraisal of benefit perception refers to gain that has already happened (Gomes, 2014; Nicholls, Perry, & Calmeiro, 2014). To avoid the confusion between what the terms "interaction" and "transaction" were all about, a new phrase "relational meaning" which was adopted to replace them referred to the meaning, i.e., "personal significance", that a person "construes" from the person-environment relationship (Devonport, 201, p. 134; Lazarus, 1999, pp. 13, 60; Lazarus, 2000, p. 665; Lazarus, 2006, p .12). "Relational" denotes that "emotions are always about person-environment relationships that involve harms (for the negative emotions), and benefits (for the positive emotions)" (Lazarus, 1991b, p. 819). To put it simply, "the relational meaning of an encounter is a person's sense of the harms and benefits in a particular person-environment relationship" (Lazarus, 1993, p. 13).

A discrete emotion, derived from appraisal processes, is linked to each distinctive relational meaning, which is also called core relational theme (Lazarus, 2006, p. 15)—a "synthesis" (i.e., summary) of maximum six separate judgments out of either primary (goal relevance, goal congruence, type of ego involvement) and/or secondary (blame or credit, coping potential, future expectations) appraisals (Lazarus, 1999, p. 94). For example, the core relational theme for anxiety is "facing uncertain, existential threat" (Lazarus, 1991, p. 122; Lazarus, 1999, p. 96). Each positive or negative emotion associates with a particular kind of appraised benefit or harm respectively (Lazarus & Smith, 1988). The intensity and type of emotion provoked depends on the particular combination of primary and secondary appraisals (Uphill & Jones, 2005).

Primary appraisal concerns whether an event is personally relevant (e.g., a person's values and goals) and is "expanded" to comprise three elements: goal relevance, goal congruence,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

type of ego involvement (Lazarus, 1991, p. 133). Goal relevance concerns whether a person views an encounter to be relevant to his or her well-being. If goal (or well-being) is not at stake, emotion, like stress, will not be aroused. Goal congruence pertains to whether the conditions of the encounter are conducive to a person's aspiration. If the conditions are favorable for attaining the goal, positive emotions will result. If the conditions are unfavorable, negative emotions will come about. Type of ego involvement refers to the role of diverse goals, personal commitments, or ego-identity in shaping an emotion, e.g., social or self-esteem, moral values, or well-being of a loved one (Lazarus, 1991, 1999). Secondary appraisal, resembling the counterpart in stress theory of Lazarus and Folkman (1984), concerns a person's perceived coping options/strategies, i.e., "whether any given action might prevent harm, ameliorate it, or produce additional harm or benefit" (Lazarus, 1991, p. 133). To choose an emotion, there are three secondary appraisal elements a person needs to evaluate: "blame and credit for an outcome, coping potential, and future expectations" (Lazarus, 1999, p. 93). Blame and credit for an outcome refers to judging who or what is responsible for a harm, threat, challenge, or benefit, and assigning credit or blame to the provocateur, perpetrator, incident, or thing; coping potential has to do with whether and how a person can minimize or get rid of a harm or threat, or bring a challenge or benefit to fruition; future expectation concerns whether person-environment relationship may change psychologically for the better or worse ("i.e., becoming more or less goal congruence") (Lazarus, 1991, p. 150).

Whether a certain set of environmental circumstances is appraised as harmful or beneficial relies on a person's particular configuration of goals and beliefs (Smith & Lazarus, 1993). As such, in Figure 2.4, appraisal and coping (i.e., primary and secondary appraisals) perform the "mediational role of linking emotional responses to environmental circumstances on the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

one hand, and personal goals and beliefs on the other" (Smith & Lazarus, 1993, p. 234). Appraisal in the person-environment relationship occurs through the process of relational meaning as core relational themes, and coping revises the relational meaning of the person-environment relationship, resulting in one or more of 15 emotions and their effects as well as morale, social-functioning, and health. Although there are no feedback loops shown in Figure 2.4, the revised model is still dynamic in a sense that processes of appraisal and coping are ever changing, and recursive.

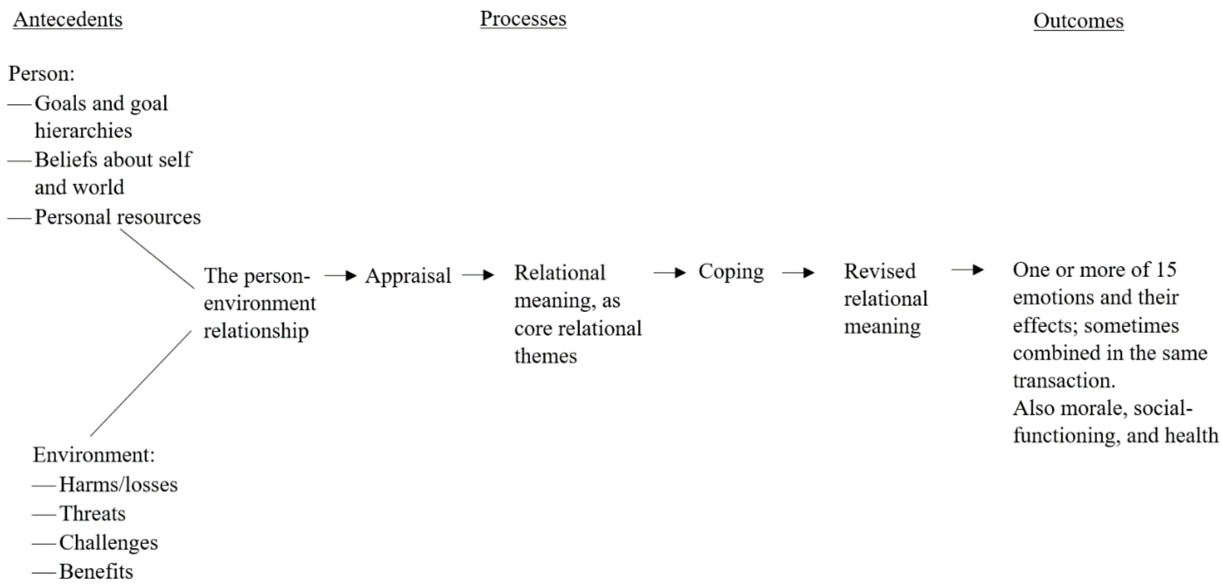

Figure 2.4. Lazarus' revised transactional model of stress and coping (Lazarus, 1999, p. 198).

Although transactional sub-category has been extensively adopted in stress and emotion research domain, some limitations do exist. First, as the stress process is a sequence of relationships between the objective environment and the person's subjective perceptions, between those perceptions and his or her experience of stress, and between that experience, and his or her changes in behavior, psychological and physiological functions, the drawback of transactional sub-category is that combining the different measurements of stress derived

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

from the sequence into a single stress index will pose a great challenge (Cox, 1993). Second, transactional sub-category assumes that personalities are associated with certain traits and patterns of behavior; however, a person adopts various ways of coping in different situations (McNamara, 2000) and over time. Third, since the cognitive appraising processes are of essence in transactional sub-category, generalization is only applicable to adolescents and adults, but not infants or very young children (Rew, 2005).

2.3 Acculturative stress

A major source of stress is having to relocate from one's culture of origin to another culture, whether permanently—as in immigration—or temporarily—as in sojourning (Lazarus, 1999). The stress associated with this struggle to adapt to a new culture is called acculturative stress, which concerns "one kind of stress, that in which the stressors are identified as having their source in the process of acculturation, often resulting in a particular set of stress behaviors that include anxiety, depression, feelings of marginality and alienation, heightened psychosomatic symptoms, and identity confusion" (Williams & Berry, 1991, p. 634). Pursuant to the definitions of stress, three categories could be used to conceptualize acculturative stress: stimulus-based, response-based, and psychological (see 2.2 Stress).

2.3.1 Stimulus-based and response-based categories

In stimulus-based category, acculturative stress is referred to as culturally-specific stressors (i.e., stressful events, and difficulties), such as cultural conflicts, discrimination, financial constraints, and communication and command of host language, in the course of one's culture of origin interacting with host culture (e.g., Castillo, Conoley, Brossart, & Quiros, 2007; Cervantes, Fisher, Córdova, & Napper, 2012; Joiner Jr & Walker, 2002; Smith & Khawaja, 2011; Wei, et al., 2007). This category mixes up acculturative stress with the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

acculturative stressor.

In response-based category, acculturative stress is generally taken as "a stress reaction in response to life events that are rooted in the experience of acculturation" (e.g., Berry, 2005, p. 708), and "manifested by uncertainty, anxiety, and depression" (e.g., Berry, Kim, Minde, & Mok, 1997; Berry, 2005, p. 702). The category confounds the impact of acculturative stress with acculturative stress itself.

2.3.2 Psychological category

The key stress concepts of psychological category, including interactional and transactional subcategories, are the interaction process between the person and environment, and his or her active appraising role (e.g., Cox & Griffiths, 2010; Lazarus & Folkman, 1984; Moos & Schaefer, 1993). As such, acculturative stress could be conceptualized as an interaction process between the acculturating person and new host cultural environment that is appraised by him or her to be faced with excessive demands which that person cannot cope, and to threaten that person's well-being. In acculturation literature, John Berry's influential work on acculturation and acculturative stress has created considerable attention for several decades, remarked by many scholars such as Kuo (2014, pp. 17, 21); Lazarus (1999, p. 186), and Ward, Bochner, and Furnham (2005, p. 38).

2.3.2.1 Berry's model for acculturative stress

Berry, Kim, Minde, and Mok (1987) developed a model of acculturative stress (see Figure 2.5) to explicate the factors influencing acculturative stress and adaptation in the context of acculturation. On the left of Figure 2.5, a person joins in a particular acculturating environment (e.g., an international student in a host university) and experiences cultural

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

changes varying from a great deal to just a little. These varying experiences lead to stressors in the middle of Figure 2.5; some people may encounter many stressors while others may encounter just a few, depending on the moderating factors at the bottom of Figure 2.5. Also, these factors together with stressors influence the degree of acculturative stress inflicted on the acculturating person. The first of these factors is the nature of the larger (or host) society, i.e., whether the larger society welcomes or dislikes newcomers, to put it simply. The more accommodating the larger society is, the less acculturative stress the newcomer experiences. The second factor is the type of acculturating group, which refers to five different groups, namely, immigrants, refugees, native peoples, ethnic groups and sojourners (Berry, Kim, Minde, & Mok, 1987). Their mental health status might be impacted by the different extent of voluntariness, movement, and permanence of contact; for instance, owing to their temporary stay and lack of permanent social support, sojourners might experience a higher level of acculturative stress manifested as mental health issues than native peoples who are more permanently settled (Berry, Kim, Minde, & Mok, 1987). Being the third factor, modes of acculturation encompass integration, assimilation, separation, and marginalization. Out of a number of studies, Berry (2003) found that "[f]or acculturative stress, there is a clear picture that the pursuit of integration is the least stressful…, whereas marginalization is the most stressful" (p. 31). The fourth and fifth factors are a number of demographic, social and psychological characteristics of the acculturating person. These characteristics affect the level of an acculturating person's acculturative stress in many studies. For example, an acculturating person with a higher education level had a lower level of acculturative stress (Berry, 1997). Yeh and Inose (2003) found that "English fluency, social support satisfaction, and social connectedness were all predictors of acculturative stress" (p. 15); in addition, international students, an example of sojourners, from Asia, Central/Latin America, and Africa, had more acculturative stress than their counterparts from Europe (p. 15), i.e., the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

greater the cultural differences/distance, the higher the acculturative stress.

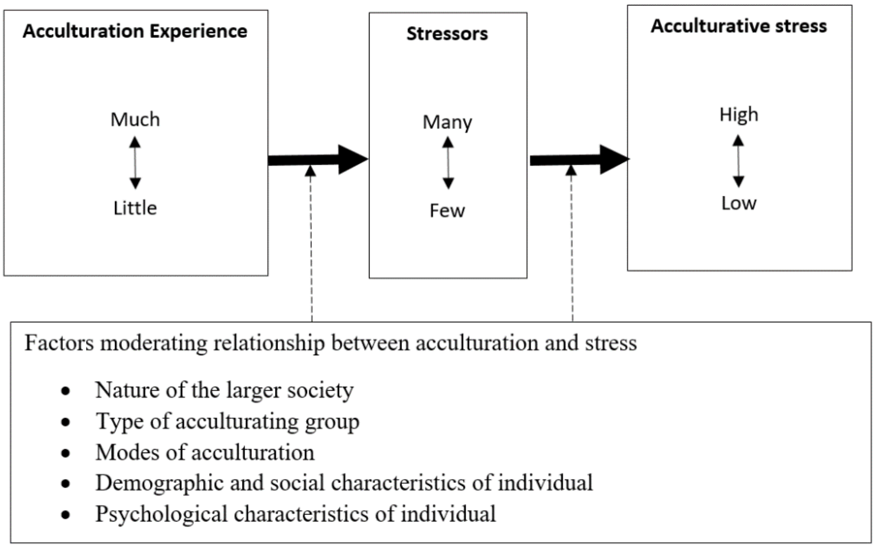

Figure 2.5. Berry, Kim, Minde, and Mok's (1987) model of acculturative stress (Berry, Kim, Minde, & Mok, 1987, p. 493).

The drawback of this early model is that it only caters to acculturation at the individual level, i.e., the acculturation of newcomers in a larger (host or dominant) society, and does not take into consideration acculturation at the group level, i.e., the changes brought to both society of origin and society of settlement during acculturation. To overcome this drawback, Berry (1997) expanded the above model to incorporate acculturation at group level on the left of new model in Figure 2.6. Berry described and explained the acculturation process within the stress and coping framework with a focus on the negative psychological and psychosomatic consequences of cross-cultural contact and change (Ward & Rana-Deuba, 1999). Acculturation experience is conceptualized as an important life event that takes in a series of life changes (Smith & Khawaja, 2011).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

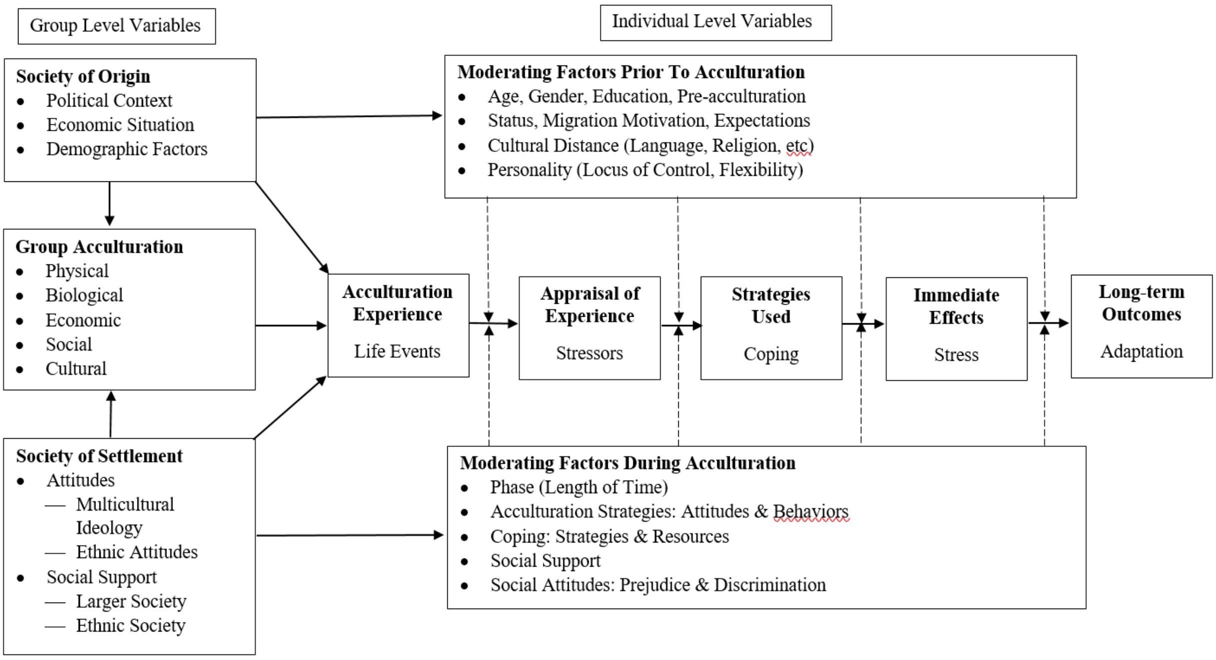

Figure 2.6. Berry's (1997) model of acculturative stress (Berry, 1997, p. 15).

As shown in Figure 2.6, Berry's (1997) model of acculturative stress depicts the central flow of acculturation experience, appraisal of experience, strategies used, the immediate effects and long-term outcomes. Being influenced by the discriminating features of societies of origin and settlement as well as group acculturation, acculturation experience is considered "a major life event that is characterised by stress, demands cognitive appraisal of the situation, and requires coping strategies" (Ward, Bochner, & Furnham, 2005, p. 71), resulting in psychological short-term and long-term outcomes. Within the process of acculturation, there are two levels of variables, i.e., group-level variables which are mostly "situational" variables, and individual-level variables which are largely "person" variables (Berry, 1997). The interplay of all these variables exert influences on stress, coping and adaptation of the acculturating person.

The group-level variables consist of characteristics of the societies of origin and settlement. Distinctive features of these societies could include political structure or stability, economic

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

system, demographic structure, degree of multiculturalism, as well as social support provided to and attitudes towards ethnic and cultural out-groups. The combination of political context, economic situation, and demographic factors in the society of origin can shed light on the extent of voluntariness and motivation for migration of acculturating groups and individuals. In the society of settlement, two broad factors affect migrants' settlement: attitudes, and social support. Attitudes include multicultural ideology and ethnic attitudes. A positive multicultural ideology refers to a policy being adopted by a society to pursue and support cultural pluralism and diversity (Berry, 1997) to promote migrants' integration. In addition, positive ethnic attitudes of host society toward migrating groups such as tolerance toward their culture, religions and food are conducive to their acculturation. Furthermore, social support from both the institutions of the larger society (such as migrants' job-seeking centre) and from the ongoing and developing ethnocultural communities provide a more positive settlement for migrants (Berry, 1997).

When the society of origin meets the society of settlement, i.e., many migrants move from society of origin to society of settlement, group acculturation results. Under the influences of two cultures, migrant group and the local community usually undergo many changes in different aspects. Physical changes involve modification of urban and/or rural landscapes because of increased population of migrant group; biological changes have to do with health of the migrant group and local community owing to new dietary intake and exposure to new disease; economic changes may be loss of job opportunities in the local community due to increased supply of human resources, or new job and business opportunities to both migrant group and local community due to new capital and job skills being brought by migrant group; social changes may result in racial hatred between migrant group and local community, or new friendships. Cultural changes may bring changes to both migrant group and local

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

community, for example, modifications in what to wear in everyday life, shifting from home language to host language, alterations to religious belief, and changes to value judgment (Berry, 1997).

At the individual level, five processes of acculturation are represented in the central flow of Figure 2.6, starting with acculturation experience and finishing with long-term outcomes. Acculturation experience involves demands generated from life events which concerns the experiences of both handling two cultures in contact, and taking part in them with different degrees (Berry, 1997). If the meaning of experiences is appraised to be non-problematic, adaptive changes will be quite easy to deal with; hence, minimal or even no acculturative stress occurs, and positive personal consequences of these experiences generally result. However, if the acculturating person appraises the meaning of the experience to be problematic, demands from such experiences will be considered acculturative stressors. According to Lazarus and Folkman's (1984) model of stress and coping, the acculturating person will engage in such coping strategies as problem-based coping and/or emotion-based coping to tackle the stressors. If the acculturating person can successfully contain the stressors, the level of acculturative stress will be low, and immediate effects positive. By contrast, if the stressors cannot be completely surmounted, the level of acculturative stress will be higher and immediate effects negative. In the extreme, when the acculturating person is overwhelmed by the stressors, and cannot successfully deal with them, immediate effects will be much negative, and a substantially high level of acculturative stress will end up in the form of psychosomatic and psychological symptoms, such as depression and anxiety. Although acculturation is usually considered negative because of migrants' adjustment to new and unfamiliar environment, evidence from various studies reveals that most migrants cope with "stressors and re-establish their lives rather well, with health, psychological and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

social outcomes that approximate those of individuals in the larger society" (Berry, 2006, p. 294). Finally, as a result of processes of cognitive appraising and coping with demands from the acculturation experiences, some long-term adaptations ranging from positive to negative psychological and socio-cultural adaptations to the society of settlement may be attained. Adaptation refers to "the relatively stable changes that take place in an individual or group in response to environmental demands" (Berry, 1997, p. 20), and can be considered as the level of fit between an acculturating person and his or her environment (Berry & Sam, 1997). A fit may not necessarily work out well for each acculturating person (Berry, 1997; Berry & Sam, 1997) probably due to incompatibility in personality, cultural values, norms, and attitudes in new culture. Hence, "[l]ong-term adaptation to acculturation is highly variable ranging from well- to poorly-adapted" (Berry, 2006, p. 295). As an long-term outcome of the process of acculturation, there are two types of adaptation: "psychological" and "sociocultural adaptation" (Ward, Bochner, & Furnham, 2005, pp. 202-209, Berry, 2006, p. 295). Psychological adaptation mainly encompasses psychological and physical well-being of an acculturating person in the new social and cultural milieu, whereas socio-cultural adaptation concerns how well an acculturating person interacts effectively in his or her daily cross-cultural living (Berry, 2006).

This model, at individual level, separates and expands the moderating factors in Berry, Kim, Minde, and Mok's (1987) model of acculturative stress into two sets of moderating factors that exist before and arise during acculturation. Examples of moderating factors existing prior to acculturation are the acculturating person's demographic characteristics, motivation for migration, expectations, and personality. Instances of moderating factors arising during the process of acculturation are the acculturating person's length of residence, acculturation strategies, coping strategies, and social support. The interplay among these factors,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

appraising, and coping during acculturation leads to the immediate effects and long-term adaptation of the acculturating person.

2.3.2.2 Some comments on Berry's (1997) model for acculturative stress

Lazarus and Folkman's (1984) transactional model of stress, coping, and adaptation laid the foundation for Berry's (1997) model of acculturative stress to emphasize the significance of the acculturating person's appraising and coping, and individual differences during cross-cultural transition; describe the acculturation process at group and individual levels; and introduce a number of individual-level moderating factors which may affect the level of acculturative stress and cross-cultural adaptation of an acculturating person (Berry, 1997, 2006; Ryan, Dooley, & Benson, 2008; Smith & Khawaja, 2011).

In spite of Berry's great contribution to acculturative stress, there are some issues for Berry's (1997) model of acculturative stress. The first issue is that acculturative stress in Berry's (1997) model of acculturative stress encompasses all sorts of stress during migration; however, some stress is part of daily life anyway regardless of whether an individual undergoes acculturation process or not (Lazarus, 1999). In other words, acculturative stress is only a subset of stress that is brought about by migration (Ryan, Dooley, & Benson, 2008). As such, Berry's (1997) model of acculturative stress does not distinguish stress due to migration from stress not due to migration. Nevertheless, it is arguable whether to differentiate them, since an acculturating person "experiences them as a whole rather than as two separate parts of life" (Bai, 2012). The second issue raised by Lazarus (1997) is that the system of variables in Berry's (1997) model of acculturative stress was "both too complicated to study, and too abstract" to completely reveal the everyday struggles of living experienced by acculturating people in host society (p. 187). In terms of what Somerfield (1997)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

commented on conceptual models of stress and coping, “the inherent complexity of [Berry’s (1997) model of acculturative stress] presents conceptual and methodological challenges that make testing a complete model difficult” since the formulation of Berry’s (1997) model of acculturative stress was based on Lazarus and Folkman’s (1984) model of stress and coping. Lazarus (1999) further added that Berry’s (1997) model of acculturative stress did not have “a microanalytic, narrative sense of the adaptational struggle” experienced by acculturating people in their daily lives (p. 187). Arguably, Bai (2012) opined that it was “a common dilemma of quantitative research methods rather than a problem with Berry’s (1997) model” (p. 18), and it was practically infeasible to cover all key variables in Berry’s (1997) model in quantitative research studies. Bai (2012) recommended that more qualitative studies be conducted to “supplement” Berry’s (1997) model of acculturative stress (p. 18). The third issue is that Berry (1997) considered acculturative stress to be “a stress reaction in response to life events that are rooted in the experience of acculturation” (p. 19). In this sense, the response of acculturative stress is confused with acculturative stress itself. The fourth issue is that Berry’s (1997) model of acculturative stress focuses on life events as stressors without considering daily hassles as alternative or complementary stressors. Life events refer to social events which indicate or require “a significant change in the ongoing life pattern of the individual” (Holmes & Rahe, 1967, p. 217), are low-frequency, high-intensity, objective occurrences that are considered stressful by most individuals regardless of whether such change is positive or negative, and lead to changes in health by accumulating these changes (Hahn & Smith, 1999; Lazarus, 1990; Macnee & McCabe, 2000), for example, death of spouse. Examples of life events in the context of acculturation include “loss of social networks”, “changes in work status” (Vinokurov, Trickett, & Birman, 2002, p. 425), immigrating to a new country, furthering one’s education in a foreign country, and being assigned to work in a culturally-different environment. Daily hassles, as minor everyday

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

events, are defined as the “experiences and conditions of daily living that have been appraised as salient and harmful or threatening to the endorser’s well-being” (Lazarus, 1984, p. 376). Another frequently-quoted definition states that daily hassles refer to the “irritating, frustrating, distressing demands that to some degree characterize everyday transactions with the environment” (Kanner, Coyne, Schaefer, & Lazarus, 1981, p. 3). Both these definitions suggest that unlike relatively objective life events, daily hassles can vary in interpretation, intensity, and importance greatly between individuals, situations, and over time, such as having too many responsibilities, and dealing with an inconsiderate smoker, because daily hassles are subjectively appraised by each individual relative to his or her available coping resources (Ruffin, 1993). These definitions also imply that a particular daily hassle can happen many times within a period of time, say a month. Therefore, as demands that happen frequently or as everyday transactions, daily hassles include chronic stressors which are “aspects of the environment that are demanding on an ongoing and relatively unchanging basis”, for example, constant, minor conflicts with family members (Hahn & Smith, 1999, p. 90). Examples of daily hassles in the context of acculturation include, but are not limited to, difficulties communicating in host language, homesickness, and political system of host society. Considering the results of previous research studies, daily hassles were stronger predictors of outcomes of psychological adaptation and health than life events were, owing to the cumulative nature of daily hassles (e.g., Chamberlain & Zika, 1990; Chang, Yang, Lin, Ku, & Lee, 2008; De Benedittis & Lorenzetti, 1992; DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Ivancevich, 1986; Ivarsson, Johnson, & Podlog, 2013; Kanner, Coyne, Schaefer, & Lazarus, 1981; Mak, Chen, Wong, & Zane, 2005; Rowlison & Felner, 1988; Ruffin, 1993; Weinberger, Hiner, & Tierney, 1987). Research findings also suggested that daily hassles could be mediators between life events and health (e.g., Ivarsson, Johnson, & Podlog, 2013; Stefanek, Strohmeier, Fandrem, & Spiel, 2012; Weinberger, Hiner, & Tierney,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

1987). As such, daily hassles are more strongly related to the outcomes of psychological adaptation and health in the stress process than are life events. In the context of acculturation, it is equally likely that "the accumulation of hassles on a daily basis may be more taxing than a singular significant event to individuals cross–culturally" (Mak, Chen, Wong, & Zane, 2005, p. 436). Hence, stressors arising from acculturation, i.e., acculturative stressors, are preferred to be conceptualized and operationalized in terms of daily hassles arising from acculturation, i.e., acculturative daily hassles, which are the daily hassles encountered during acculturation, consist of "both acculturation-specific and acculturation non-specific daily hassles" (Lay & Nguyen, 1998, p. 173). These hassles have their implications for the psychological adaptation and health of an acculturating person (Lay & Nguyen, 1998).

2.4 Differences between mainland China and Hong Kong

Between 1644-1911, China was under the rule of Qing Dynasty, which was overthrown by Dr Sun Yat-sen in October, 1911 to end 4,000 years of China's imperial rule, establish Nationalist Party, and name the country officially as the Republic of China in January, 1912. After World War II with the defeat of Japan in 1945, an all-out civil war broke out between the Nationalist Party and the Chinese Communist Party ("CCP"), which was formed in 1921 to promote revolution based on Marxist principles. Eventually, the Chinese Communist Party gained full control over most of China, and named the country officially as the People's Republic of China ("PRC") in October 1949, whereas the Nationalist Party retreated to Taiwan until now. From 1949 onwards, PRC practised socialism in mainland China, as opposed to capitalism in Hong Kong. On July 1, 1997, the sovereignty of Hong Kong reverted to the PRC from the United Kingdom to make Hong Kong as a special administrative region of the PRC under the "One country, Two systems" arrangement to

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

maintain the capitalist system and the way of life of Hong Kong people for 50 years, according to the Article 5 of The Basic Law of the Hong Kong Special Administrative Region of the People's Republic of China ("BL").

Mainland China and Hong Kong are quite different in many aspects because of Hong Kong being a former British colony for about 150 odd years between 1842 and 1997. During the colonial period, Hong Kong transformed itself from a small fishing village to one of world's most significant financial centres nowadays. Such huge socio-economic changes as well as the long-standing British-style systems of law, politics, and education in Hong Kong distinguish the unique cultural landscape in Hong Kong from that in mainland China. As opposed to Renminbi circulated in mainland China, Hong Kong dollars remains to be the legal tender in Hong Kong after 1997 (Article 111 of BL). Hong Kong continues to practise her own taxation system, which is independent of that in mainland China (Article 108 of BL). Unlike mainland China, Hong Kong remains to be a common law, rather than civil law, jurisdiction (Article 8 of BL). Largely preserving the political structures of the British colonial era, the post-1997 Hong Kong government system has three separate powers, namely, the legislature, the executive, and the judiciary (Sections 2-4 of Chapter IV of BL). Hong Kong enjoys "independent judicial power, including that of final adjudication" (Articles 2 and 19 of BL). The courts of Hong Kong can "exercise judicial power independently, free from any interference" (Article 85 of BL), and do frequently pronounce judgments on judicial reviews of administrative decisions (e.g., *Li Wai Hung Cesario v. Administrative Appeals Board*, 2015) and domestic legislation as to their compatibility with BL (e.g., *Wong Chi Fung v. Secretary for Justice*, 2015). However, this independent judicial power has been challenged by the Standing Committee of the National People's Congress of the PRC ("SCNPC") to interpret the BL to make final determinations (Article 158 of BL) in

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

few occasions, resulting in protests and heated controversy over whether these SCNPC's interpretations undermine Hong Kong's judicial independence and/or compromise the integrity of Hong Kong's judicial process (e.g., Lau, 2016, November 10; Tong, 2016, November 8; Tsang & Lo, 2016, November 8; Ng & Yeung, 2016, November 9; Un, 2016, November 8). However, in mainland China, judiciary independence is not totally upheld because law is thought to be a tool for governance by CCP (Espelid, 2014; Lawrence & Martin, 2013), and court decisions could be interfered by various internal and external controls such as adjudication supervision; local governments; CCP; people's congresses; and procuratorate (Congressional-Executive Commission on China, n. d.; Woo, 1991). Being the dominant political institution in the PRC and "holding itself above the law", CCP "insists that judicial authorities cannot investigate" its members without its permission (Lawrence & Martin, 2013, p. 17). For example, in the trial case of the former Chongqing Party Secretary Bo Xilai in 2013, CCP first conducted its own investigation and then decided as to whether to hand over him to the judiciary authorities for adjudication (Lawrence & Martin, 2013). Nevertheless, CCP has recently started some judicial reforms to make judiciary more independent (Congressional-Executive Commission on China, n. d.; Lin, 2016; Zhai, 2014, July 10). In economics, Hong Kong, as a capitalist economy with minimum government's intervention, ranks as the freest economy in the world for the twenty-second consecutive years, whereas mainland China, as a "socialist market economy" characterised by substantial state's intervention (Article 15 of Constitution of the PRC, 2004), was ranked number 144 out of 178 economies, according to the 2016 Index of Economic Freedom formulated by The Heritage Foundation (Chandran, 2016, February 1). This composite index measures ten economic-freedom factors, which are grouped under four broad categories—rule of law (property rights, and freedom from corruption), limited government (government spending, and fiscal freedom), regulatory efficiency (business freedom, labor freedom, and monetary

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

freedom), and open markets (trade freedom, investment freedom, and financial freedom), to arrive at an overall score by averaging these ten economic-freedom factors, with equal weight being given to each (The Heritage Foundation, 2016). Apart from economic freedom, Hong Kong residents continue to enjoy freedom of speech, of the press and of publication; freedom of association, of assembly, of procession and of demonstration; and the right and freedom to form and join trade unions, and to strike (Article 27 of BL). Each year, Hong Kong has quite a number of assemblies, demonstrations, and protests, some of which are probably to be banned in mainland China, e.g., June 4 annual candlelight vigil held in Hong Kong's Victoria Park to remember 1989 Tiananmen Square crackdown since 1989; July 1 annual march held in Hong Kong since 1997 as a channel to fight for democracy, universal suffrage, rights of minorities, protection of freedom of speech, and many other political concerns. Radio phone-in programs and letters to the editors of newspapers are still extant. Critiques of government policies, strategies, tactics and performance, including some scathing criticisms of chief executive or government officials of Hong Kong (e.g., Lam, 2016, September 24), are ongoing. Critics and callers to radio stations; newspaper/magazine readers, columnists and journalists continue to freely express their widely divergent, but non-libelous, views. Furthermore, Internet access in Hong Kong as well as access to international television and radio broadcasts, via the Internet or satellite receivers, from services including CCTV from mainland China, FTV from Taiwan, BBC from the UK, VOA from the USA, DW Akademie from Germany, NHK from Japan, just to name a few, are unrestricted (Freedom House, 2016a). By contrast, in mainland China, access to foreign news outlets such as South China Morning Post, Reuters, Bloomberg News, and New York Times; and social media services including Twitter, Facebook, YouTube, Instagram, Snapchat, and various Google services was / is blocked (Carsten, 2015, January 19; Freedom House, 2016b; Tsai, 2010; Ward-bailey, 2014, December 29; Wei, 2015, February 13). Although Article 35 of the Constitution of the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

PRC, 2004 assures that citizens of PRC enjoy freedom of speech, of the press, of assembly, of association, of procession and of demonstration, CCP's discretion as to things deemed harmful to its ruling power in mainland China can pre-empt these rights (Freedom House, 2016b; King & Roberts, 2013). The Central Propaganda Department of CCP monitors the appointment of media personnel and controls over news coverage by coordinating with General Administration of Press and Publication and State Administration of Radio, Film, and Television to make sure that the news content falls in line with CCP's doctrine (Esarey, 2006; Freedom House, 2016b; Zhao, 2004). Media in mainland China serve as the publicity fronts for the CCP, and journalists being mouthpieces for CCP speak no evil (Esarey, 2006; Tiezzi, 2016, February 20), as corroborated by what Jiang Zemin, former State Chairman and Party General Secretary of the PRC, told CBS reporter Mike Wallace on August 15, 2000 as follows:

> "We insist on 'one hundred flowers blooming and one hundred schools of thought contending.' China's news has freedom. But this freedom must obey and serve the interest of protecting the state and the public." (Cheung, 2007, p. 358).

Mainland China's press freedom is consistently rated much low on international press freedom indices. According to the Freedom of the Press 2016, which ranks the degree of press freedom in 199 countries and territories in 2015, mainland China was ranked 186th (Freedom House, 2016c) and rated "not free" (Freedom House, 2016b). Pursuant to the 2016 World Press Freedom Index, which assesses the level of press freedom in 180 countries in 2015, mainland China was ranked 176th, and has continually stayed in the bottom six countries since the World Press Freedom Index was first published in 2002 (Reporters without borders, 2016). Compared with severely restricted news reporting in mainland China, Hong Kong has relative press freedom, as evidenced by the fact that Hong Kong was

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ranked 76th and rated "partly free" in the Freedom of the Press 2016 (Freedom House, 2016a, 2016c), and 69th in the 2016 World Press Freedom Index (Reporters without borders, 2016). Nevertheless, press freedom in Hong Kong has been increasingly threatened in recent years, as indicated by a number of violent attacks on journalists; cases of growing self-censorship in news content due to mainland China's enormous economic influence over Hong Kong media owners; and businesses' withdrawal of advertising from newspapers that criticized mainland China and supported prodemocracy protesters; difficulties faced by journalists in obtaining information they need for reporting; and government manipulation of the media in reporting news (Buckley & Forsythe, 2015, January 16; Freedom House, 2015, 2016a; Hong Kong Journalists Association, 2015, March 27).

In everyday life, Cantonese, a dialect in southern China, remains the most widely spoken language in Hong Kong, and written Chinese is still largely traditional Chinese character, even though Hong Kong has become an integral part of the PRC after 1997. Both Chinese and English are the official languages in Hong Kong (Article 9 of BL). By contrast, Putonghua (also known as Mandarin) is the commonly-spoken and sole official language in mainland China, and written Chinese is simplified Chinese character. In education, unlike mainland China where Putonghua is the medium of instruction in both local middle (also referred to as secondary) schools and higher educational institutes, Hong Kong adopts English as the main medium of instruction in a large number of local secondary schools and most of tertiary institutes. Since mainland Chinese students need to obtain a student visa / entry permit issued by the Hong Kong Immigration Department in order to pursue tertiary-level study in Hong Kong, they are regarded as non-local students and pay a much higher tuition fees for the government-funded programmes, but the same fees as their local counterparts for the self-financed programmes. As regard to pace of life, Hong Kong was

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ranked 10th whereas China was ranked 23rd out of 31 countries and territories (Levine & Norenzayan, 1999), indicating that Hong Kong has a faster pace of life than does China. Explicating the relationship between economic factors and the pace of life, Hoch's (1976) theory suggests that growing population of economic cities bid up the cost of living such as higher rent or transport costs. Under these economic pressures, "economizing on time becomes more urgent, and life becomes more hurried" (Hoch, 1976, p. 857). Corroborating Hoch's (1976) theory, Levine and Norenzayan (1999) confirmed that places with more vital economies were faster in terms of pace of life. As Hong Kong is a global financial hub ranked fourth in the Global Financial Centres Index nineteenth edition (Z/Yen Group Limited, 2016) and the world's most competitive economic entity ranked first in IMD World Competitiveness Yearbook 2016 (IMD World Competitiveness Center, 2016), residents "are posited to work within a tight schedule to keep pace with economic development", resulting in faster pace of life in Hong Kong (Cheung & Chow, 1999, p. 375).

Considering the above differences between mainland China and Hong Kong, it is conceivable that when mainland Chinese students come to Hong Kong to study, considerable adjustments in their academic study and daily living are required.

2.5 Stressors encountered by mainland Chinese students in Hong Kong

Although there are a raft of research studies related to adjustment issues of mainland Chinese students pursuing their overseas education, few concern such issues of these students in Hong Kong. Based on 11 focus-group interviews of total 54 mainland Chinese students pursuing undergraduate and postgraduate studies in four local universities and staying in Hong Kong from 1 month to 4 years, Yu & Zhang (2016) found that linguistic adaptation, social network, perceived discrimination, and different political ideologies were their most significant

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

adjustment problems and difficulties. In a study adopting both quantitative and qualitative methods and including 312 mainland Chinese students from 7 government-funded universities in Hong Kong studying at various academic levels ranging from sub-degree to doctoral, Cheung (2013) revealed four challenges faced by these students, namely, language adjustment, academic adjustment, socio-cultural adjustment, and financial adjustment. Pan, Yue, and Chan (2010) investigated vital factors of acculturative hassles encountered by 400 mainland Chinese postgraduate students in 6 government-funded universities in Hong Kong, and identified four similar vital factors: language deficiency, academic work, cultural difference, and social interaction. In a qualitative study of 15 mainland Chinese undergraduate students' adjustment to living and studying in a local government-funded university, Xie (2009) found four categories of their challenges: financial burdens, language barriers, teaching/learning differences, and cultural barriers. In light of these limited research in Hong Kong, the major difficulties (i.e., stressors) facing many mainland Chinese students may be: language stressor, academic stressor, socio-cultural stressor, and financial stressor as well as perceived discrimination and different political ideologies.

2.5.1 Language stressor

To be accepted by Hong Kong's universities and tertiary-level learning institutions, all international students, including mainland Chinese students, from non-English speaking countries or regions must attain an acceptable score in English proficiency tests such as the Test of English as a Foreign Language ("TOEFL") or the International English Language Testing System ("ILETS") when applying for admission. Many mainland Chinese students in Hong Kong still perceive their command of English to be not good enough to navigate their studies and everyday life, in particular listening and speaking, probably because they lack an English language environment to practise English in mainland China, where English,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

being learnt as a second language by most students, is only used in English classes and all other disciplines are taught in Chinese (Pan, Yue, & Chan, 2010; Yu & Zhang, 2016). By contrast, English is the main medium of instruction in most Hong Kong's universities and tertiary learning institutions (Cheung, 2013), and students need to acquire most disciplinary knowledge via English, such as attending class lectures in English, reading textbooks and materials in English, and turning in assignments and theses in English (Yu & Zhang, 2016). Moreover, since Hong Kong's universities and tertiary learning institutions take on academic talents around the globe, adjusting to different English accents could pose an additional challenge to mainland Chinese students (Cheung, 2013).

In everyday life, Cantonese is the lingua franca among Hong Kong residents. Although Cantonese and Putonghua are Chinese languages, they are quite different from one another in terms of pronunciation, intonation, and expression when spoken (Xie, 2009). In terms of written Chinese, traditional Chinese characters are used in Hong Kong, as opposed to simplified Chinese characters in mainland China (Xie, 2009). Mainland Chinese students from non-Cantonese speaking regions may be hindered from engaging in university student communities because of the low-level proficiency in Cantonese language (Min & Chau, 2012). As Hong Kong is a multilingual and multicultural society, other Chinese dialects and foreign languages have an impact on Cantonese language used there (Wu, 2006). Even for mainland Chinese students coming from Cantonese speaking regions have to adapt to Hong Kong's Cantonese environment owing to some differences in lexicon, linguistic style, and pronunciation (Yu & Zhang, 2016).

2.5.2 Academic stressor

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Strong motivation for academic achievement is commonplace in Chinese families and culture, since success in higher education is considered important and advantageous for their self-fulfillment and career advancement (Zeng, 2006). These high academic aspirations and achievement motivation for their studies become a source of academic stress for mainland Chinese students (Pan, 2008). In Pan (2008)'s research on acculturation and resilience of mainland Chinese postgraduate students in Hong Kong, academic stress is the most important risk factor for their emotional well-being.

English language as the medium of instruction, and teaching and learning styles are two main factors influencing academic adjustment of mainland Chinese students in Hong Kong (Cheung, 2013). The findings of Cheung (2013)'s study reveal that they were comfortable with their listening and reading skills in English, but thought that their speaking and writing skills in English were far from satisfactory. This could attribute to the fact that in mainland China, all course materials, learning instructions, and assignments are in Chinese (Cheung, 2013)—a Chinese teaching and learning environment. That is why it takes time for them to adjust to Hong Kong's all English teaching and learning environment. In Cheung (2013)'s study, a majority of mainland Chinese students were satisfied with the Hong Kong's student-centered teaching and learning styles, which follow the Western educational practice to train students to learn how to learn and encourage them to express their own views by various means such as studying case studies, doing class presentations, and engaging in small group discussion, as opposed to mainland China's teacher-centered teaching and learning styles, which highly value the virtue of classroom harmony and the role of a teacher to pass knowledge on to students who are supposed to be silent and passive learners in class (Pan, 2008; Zeng, 2006). Nonetheless, some students, in particular the newcomers, had a growing level of unease in group discussions and presentations (Cheung, 2013), due to their getting

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

accustomed to teacher-centered teaching and learning styles in mainland China and/or limited proficiency in oral English. Wang and Shan (2006)'s qualitative study of 10 mainland Chinese postgraduate students pursuing their master's level studies in Australia found that most of the mainland Chinese students preferred having precise answer from teachers to participating in laborious research or group discussion to get the answer. In Xie (2009)'s qualitative research on the living and learning experiences of 15 mainland Chinese students pursuing undergraduate studies at a university in Hong Kong, participants encountered five academic difficulties: study stress, different learning styles, difficulty with English, cooperative skills, and different teaching style. Study stress came from heavy study load, and risk of being expelled for poor grade point average. With respect to different learning styles, students in Hong Kong need to be more independent and take more initiative in learning, say managing their own time, choosing their own courses, and engaging in self-learning; by contrast, in mainland China, "learning is heavily structured and the teacher instructs the student to a greater extent" (Xie, 2009, pp. 110-111). Difficulty with English refers to adjusting to the learning environment with English as the medium of instruction in Hong Kong, as opposed to mainland China where the medium of instruction is Chinese. Cooperative skills could be a challenge to mainland Chinese students since they did not need to do much team work in their prior study before coming to Hong Kong, where learning at universities puts great emphasis on team work and group projects. Concerning different teaching style, students in Hong Kong are expected to engage in wide reading to review and reflect on course materials, while in mainland China, reading the textbook of a course is usually good enough.

2.5.3 Socio-cultural stressor

Although Hong Kong is now part of PRC, Hong Kong was once a British colony for more

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

than 150 years and western culture has a profound influence on Hong Kong society. Given that over 90 per cent of Hong Kong population is ethnic Chinese (Census and Statistics Department, 2012), Hong Kong is a melting pot of oriental and western cultures. Mainland Chinese students need to adjust themselves by learning how to behave and what to expect in this unique cultural and value system which differs from their own (Pan, Yue, & Chan, 2010). Severing their direct connections with families, relatives, and friends in mainland China, adjusting their lifestyle as well as setting up a new social network in an unacquainted milieu from scratch could pose a big challenge for many mainland Chinese students (Pan, Yue, & Chan, 2010).

In their qualitative study of 54 mainland Chinese students, Yu and Zhang (2016) found that most of them experienced social isolation during their sojourns in Hong Kong, and tended to stay with other mainland Chinese students in and after class. In addition to putting academic results first and heavy school workload, language barrier may hinter mainland Chinese students in participating in local students' activities because their Cantonese may not be good enough (Cheung, 2013; Xie, 2009). However, proficiency in Cantonese may not be a sufficient condition to ensure a smooth transition (Gu, 2011). The findings in Cheung (2013)'s study showed that most of respondents said that "one of the main reasons why they did not mingle with local students was cultural differences" (p. 231). Even mainland Chinese students coming from Cantonese-speaking provinces who could speak fluent Cantonese and basically have no big language barrier, mingling with local students still poses a problem to them because of their different upbringings (Cheung, 2013; Xie, 2009; Yu & Zhang, 2016) and unfamiliarity of Hong Kong's values, norms, popular terms, and jokes (Cheung, 2013; Gu, 2011). As such, different cultural values and conflict may have a greater effect than language barrier on their social interaction with locals (Cheung, 2013; Yu & Zhang, 2016).

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

For example, when interacting with local students, mainland Chinese counterparts always shied away from expressing political views on controversial issues such as Tibet, Taiwan, and the June 4 Tiananmen Square incident to avoid conflict (Cheung, 2013). In a study on the worldviews of Chinese students from mainland China, Taiwan, and Hong Kong pursuing their studies in the United States, Chinese students from mainland China and Taiwan were more "pragmatic, doing-oriented, and goal-oriented" (Kwan, Sodowsky, & Ihle, 1994, p. 195), while the counterparts from Hong Kong exhibited to be more "acceptance to self, others, and nature" (Kwan, Sodowsky, & Ihle, 1994, p. 192). To account for such different worldviews, Kwan, Sodowsky, and Ihle (1994) explained that "the students from Hong Kong may have had a different worldview preference than students from [m]ainland China and Taiwan because of their British colonization experiences and their consequent accommodating attitude towards the co-existence of diverse cultures" (p. 195). According to Yu and Zhang (2016), no fixed class system in Hong Kong universities may also contribute to the mainland Chinese students' experiencing social isolation. Unlike universities on the mainland China in which students are allocated to a fixed class so that they interact with a fixed group of classmates throughout their course of studies, Hong Kong universities adopt a credit-based system in which students are free to take any elective courses they wish to meet their personal interests and study schedules as well as academic requirements (Yu & Zhang, 2016). In other words, students in Hong Kong universities are required to be independent and responsible for their own learning process as well as manage their time effectively, such as deciding how many courses to be taken in a semester and designing their own time-table (Xie, 2009). Therefore, students do not always stay with the same group of classmates at universities to develop a deeper friendship with each other (Yu & Zhang, 2016). To cope with these problems, many mainland Chinese students seek out friendship and support from participating in students' organizations and activities organized by mainland Chinese students

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

(Cheung, 2013; Yu & Zhang, 2016). Playing a vital role in facilitating their adjustments to their study and living experiences in Hong Kong, these organizations and activities not only provide a sense of familiarity, but also a sense of connection (Cheung, 2013). However, this, in turn, reduces their interaction with local students further, resulting in limited social experiences. In a study of mainland Chinese students' resilience, i.e., ability to sustain adjustment and withstand stress, in Hong Kong, Cheung and Yue (2013) found that these students' connectedness with Hongkongers produced "a significant positive effect on resilience and a significant negative effect on depressed mood" (p. 785). Citing evidence from previous overseas studies on international students, Cheung (2013) mentioned that "international students who interacted less with host nationals had more adjustment issues and were less satisfied with life in general" (p. 225). Similarly, Pan, Yue, and Chan (2010) cited from various psychological studies and revealed that "a lack of social contacts within the host society was found to be related to a decline of emotional well-being and health problems such as anxiety, depression, somatic symptoms, and paranoia, and highly correlated with psychological distress" (p. 166).

Other living issues faced by mainland Chinese students in Hong Kong such as hot and humid climate, food being mild tasting and having few vegetables, high cost of living, cramped housing, learning to be independent and self-disciplined, managing time effectively, homesickness, and loneliness also make their lives stressful (Chen, 2014, July 31; Chen, 2014, August 19; Kao & But, 2013, February 5; Kell & Vogl, 2012; Xie, 2009). Although some of these may seem to be trivial, they can take up much of the mainland Chinese students' time and effort to adjust (Steele, 2008).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2.5.4 Financial stressor

In Cheung (2013)'s study to examine adjustment challenges of mainland Chinese students in Hong Kong, finance is one of four challenges faced by them. Their concerns lie in high living expenses and tuition costs; many of them thought that landing a part-time job not only helped ease some of their financial burden, but also assisted them to integrate better into Hong Kong society (Cheung, 2013). Although they can work on campus for not more than 20 hours per week or off campus without any limit in relation to working hours and location during the summer months (Immigration Department, 2015, December 11), getting a part-time job on or off-campus is not easy for them at all because of "language and cultural differences" (Cheung, 2013, pp. 232-233). A noteworthy point in Cheung (2013)'s study is that mainland Chinese postgraduate and undergraduate students in Hong Kong have a marked difference of opinion about finance. In general, finance is a not big problem for postgraduate students as opposed to undergraduate counterparts. The reason was that most postgraduate students doing research-based degree programs could obtain full scholarship and some stipends to make them live comfortably when studying in Hong Kong, whereas most undergraduate students did not receive any scholarship, and did pay a comparatively much higher non-local tuition fee and meet daily expenses on their own. Similar findings are corroborated by the studies of Xie (2009) as well as Pan, Yue, and Chan (2010). In Xie (2009)'s study on mainland Chinese undergraduate students in a government-funded university in Hong Kong, a common complaint among self-financed students was that they needed to keep a close eye on their expenses due to high cost of living (Kao & But, 2013, February 5). Although financial stressor is not that big of a problem to the scholarship holders, they faced an additional academic stress to attain a high grade point average in their undergraduate studies such as 3.5 for the maintenance of their scholarships in the following year (Xie, 2009). Pan, Yue, and Chan (2010) dismissed financial difficulty as a stressor for

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

mainland Chinese research postgraduate students because all the government-funded universities in Hong Kong offer them scholarships and/or stipends, which meet their tuition fees and living expenses, in the course of their studies. In a more recent qualitative study on exploring the stressors encountered by mainland Chinese undergraduate and postgraduate students in Hong Kong, the findings even made no mention of financial stress as one of primary or secondary stressors at all (Yu & Zhang, 2016). Owing to the rapid economic development in PRC in the past 25 years, there has been a tremendous growth of middle-class and wealthy families who can afford to send their children to study outside mainland China (Cheung, 2013; Li, 2010; Li & Bray, 2007). Financial concern may be no longer a major stressor for these affluent mainland Chinese students (Bai, 2016; Cheung, 2013; Xie, 2009).

2.5.5 Perceived discrimination

In the qualitative study by Yu and Zhang (2016), it was revealed that many newly arrived mainland Chinese student participants perceived to be treated differently by the locals outside the campus, because when mainland Chinese student participants spoke Mandarin or heavily accented Cantonese, the locals would adopt an unfriendly attitude. Yu and Zhang (2016) opined that owing to the absence of feedback from the locals, a solid conclusion that mainland Chinese students are really discriminated against was hard to drawn. Some of the mainland Chinese student participants attributed such perceived discrimination to the influence by featured articles from local newspapers and television programmes, which are claimed to intensify the tension between mainland Chinese and locals (Yang, 2013, May 29; Yu & Zhang, 2016) for reporting that newly arrived immigrants from mainland China who felt discriminated against in their daily lives (Zhao, 2015, June 3) due to their accented Cantonese, physical appearance, female status, immigrant status, and lower socioeconomic status are perceived to be uncultured and ill-mannered (Chen, 2014, December 16; Chou,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2012; Mo, Mak, & Kwan, 2006; Wu & Mak, 2011). In Xie (2009)'s qualitative study of the adjustment issues faced by mainland Chinese undergraduate students in Hong Kong, only 4 participants felt discriminated against by university staff and local students, whereas 9 participants disagreed and did not have such feeling.

By contrast, in the study of Pan, Yue, and Chan (2010), perceived discrimination was not found to be a stressor for the mainland Chinese research postgraduate students in Hong Kong. Pan, Yue, and Chan (2010) explained that "[s]ince 1997, frequent communication and mutual understanding have been increasing between Hong Kong and mainland China. In fact, most mainland migrants experience positive attitudes rather than discrimination from the local people in Hong Kong" (p. 173). Similarly, Cheung (2013) did not find perceived discrimination among mainland Chinese undergraduate and postgraduate students to be one of the four key adjustment stressors in Hong Kong, even though discrimination was included in the questionnaire as one of the reasons why mainland Chinese students did not mingle with local Hong Kong students. These findings of Pan, Yue, and Chan (2010) as well as Cheung (2013) echoes Kell and Vogl (2012)'s qualitative analysis of the experiences of international students in Hong Kong. A mainland Chinese student appreciated the acts of kindness of locals for walking with that student to locate bus stop (Kell & Vogl, 2012).

2.5.6 Different political ideologies

As a capitalist society rather than a socialist or communist enclave, Hong Kong has been struggling to straighten out the deep-seated mainland "China factor" for many decades (Ma, 2015, p. 39). Soon after Japan surrendered in World War II, civil war broke out in mainland China and the CCP eventually seized power, leading to a substantially large influx of refugees coming to Hong Kong to flee from the Communist rule in the 1950s (Mark, 2007).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Inspired by a protest statement issued by the Chinese Ministry of Foreign Affairs on 15 May 1967 to the British Chargé de Affaires in Beijing, anti-British demonstrations in Beijing and Guangzhou, and editorials in the People's Daily (人民日报, Renmin Ribao), the communist-dominated Federation of Trade Unions and other local communists in Hong Kong turned a labor dispute into a territory-wide campaign against British colonial rule in 1967, resulting in bloody riots, demonstrations, strikes, violent clashes with Hong Kong police, bomb explosions, and heavy casualties (51 killed and 848 wounded) (Yep, 2012). In 1989, the suppression of student movement to protest governmental corruption and nepotism, and to demand democratization in Tiananmen Square in the PRC (Bowie, 1990) precipitated many Hong Kong people to emigrate to foreign countries to avoid any form of governance under the PRC's sovereignty (Kwong, 2016b). To counter brain drain and induce key Hong Kong residents to remain and work in Hong Kong, the United Kingdom ("UK") granted 50,000 heads of households and their families (up to 225,000 people) the right of abode in the UK without leaving Hong Kong to meet residency requirements of UK citizenship (Goldammer, 1995), under the British Nationality (Hong Kong) Act 1990.

In the early post-1997 period, fear about mainland "China factor" subsided since the PRC government exercised little ostensible intervention in Hong Kong's social and economic policy making (Ma, 2015, p. 43). However, in 2003, six years after Hong Kong's return to the PRC in 1997, half a million of Hong Kong people marched and protested against perceived post-1997 governing ills and the proposal on enacting laws on national security under the Article 23 of the BL, for dissatisfaction about poor economy and pandemic control as well as fear of eroding individual rights and freedom of expression (Kwong, 2016b; Ma, 2012). To ease the concern for governance crisis and instability in Hong Kong, the PRC government in 2003 introduced Individual Visit Scheme to salvage Hong Kong's ailing

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

economy right after Severe Acute Respiratory Syndrome; and the Closer Economic Partnership Arrangement to prop up Hong Kong's economy and facilitate China-Hong Kong integration (Kwong, 2016b; Ma, 2012; Legislative Council Secretariat, 2014, May 7; Tourism Commission, 2016, August 29). Though such tourism economy and further mainland China-Hong Kong integration brought Hong Kong's economy back to life, they had serious repercussions on conflicts and hostility between Hong Kong and mainland China, leading to a new stage of anti-mainland-China sentiments (Ma, 2012). A surge of mainland Chinese visitors to Hong Kong impacted the livelihood of Hong Kong people (Prendergast, Lam, & Ki, 2016). Property prices, rents, and prices of consumer goods shot up, in line with the economic law of demand and supply in a capitalist society like Hong Kong (Lee, 2014, April 28; Liu, 2014, January 15). On the other hand, in the 20 years since implementing the "One Country and Two Systems" policy in 1997, the progress towards democracy in Hong Kong has more or less remained stagnant (Kwong, 2016a), such as no election of its chief executive by universal suffrage, and no direct election of all Legislative Councillors in Legislative Council contrary to what stipulates in the Articles 45 and 68 in the BL respectively. Being sceptical about increased economic and social ties with mainland China, many Hong Kong people worried that such dependence on mainland China's economy enabled the PRC government to wield greater political influence over Hong Kong's economic, social and political affairs, resulting in the loss of local identity (Kwong, 2016b; Ma, 2012). The contradictions inherent in, the concept and practice of the "One Country, Two Systems" policy, especially the conflict among the ideologies of CCP-led socialist political system in mainland China; the aspirations towards Western-style liberal democracy on the part of "pan-democrats" and their followers in Hong Kong (Chen, 2016); and the objectives of localism in Hong Kong to uphold the will of Hong Kong people to reclaim their own destiny, to reject the CCP's authoritarian rule, and to reclaim unique local cultural identities as different from

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

mainland China (Chen & Szeto, 2015), coupled with livelihood issues brought about by a large influx of mainland Chinese tourists and perceived ill-governance of the Hong Kong government, sparked a series of high-impact public protests, including “Anti-Express Rail Link” in 2010, “Anti-National Education Campaign” in 2012, “Umbrella Movement” in 2014, “Anti-parallel Trading Protests” in 2015, and “Mongkok Riot” in 2016 (Kwong, 2016b). In brief, a strong sense of resistance and hostility against mainland Chinese visitors and the PRC government led to an increasingly strong anti-mainland China sentiment (Kwong, 2016a).

Although the main purpose of mainland Chinese students in Hong Kong is to pursue their studies, they are not living in a bubble, and are aware of the local current affairs from various media to say the least. With their upbringing in an authoritarian socialist regime with a strong emphasis on unified political ideology and tight control on information circulation, media and Internet access, the newly-arrived mainland Chinese students may find it difficult to understand the liberal political scenes in Hong Kong, where is a melting pot of diametrically opposite points of view (Ye, 2016, November 12; Yu & Zhang, 2016). To cope with strong anti-mainland China sentiment, some mainland Chinese students constructed concurrent identities of a “free” self that was spatially mobile and ideologically unconfined, and an “elite” self that was among the winners of global competition, to justify their much-challenged legitimacy of pursuing their studies in Hong Kong and often-questioned decision to give up attending top mainland Chinese universities (Xu, 2015b, pp. 15, 39). During face-to-face conversations with their Hong Kong counterparts, many mainland Chinese students deliberately tried not to touch on controversial social and political matters to avoid unnecessary conflicts (Cheung, 2013; Peng, 2016; Yu & Zhang, 2016). In on-line social media such as Facebook or WhatsApp, most of these sojourn students would tend to remain

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

silent or disregard the anti-mainland China discourses, even if they disagreed with or felt annoyed at such discourses (Peng, 2016). Nevertheless, taking an eclectic approach to various stances or opinions should be conducive to their adaptation to the more liberal environment in Hong Kong (Yu & Zhang, 2016). "That is, they need to take consideration of the perspectives of locals and respect differences, so that gradually a common ground can be created between the two groups" (Yu & Zhang, 2016, p. 13).

2.6 Conceptual framework

As mentioned in section 2.2, there are many definitions of stress. Under stimulus-based category, stress can be defined as either a situational stimulus or life events impinging on a person, whereas under response-based category, stress can be defined as a person's psychological or physiological response to stressfully situational stimuli. Another group of definitions of stress is psychological category, one of which is Lazarus and Folkman's (1984) transactional model of stress and coping, an often cited and widely used stress model; in such model, stress was defined as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p. 19). In this study, the above Lazarus and Folkman's (1984) definition is adopted, because this definition recognizes that stress is the product of the person's subjective perception of imbalance between environment's objective demands on him/her and his/her coping resources. Also, this definition of stress overcome the common weakness of stimulus-based and response-based categories of stress definitions, which treat an individual like a machine to objectively convert the environmental stimulus into biological / psychological response, and largely ignore the individual differences toward the stimulus as well as the interactions between the individual and his/her various environments.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

In this study, stress is conceptualized to cover both stressors and responses to stressors, which are process components of stress, since stress is a process of interaction between stressors (i.e., events or transactions between the person and the environment), cognitive appraisal and coping, outcome, and emotions. Therefore, items in survey can be stressors or responses to stressors. The stressors are the ones being appraised (i.e., perceived) to be either harmful, threatening, or challenging by the concerned individual.

The concept of "acculturative" in the term "acculturative stress" comes from acculturation. Acculturative stress is the stress resulting from the process of acculturation. From a psychological perspective, acculturation refers to the process by which an individual experiences cultural changes across various life domains such as language, ethnic identification, and affective expression arising from continuous contact with another culture. In other words, acculturative stress is a process of interaction between acculturative stressors, cognitive appraisal and coping, outcome, and emotions. Hence, acculturative stress is a stress reaction in response to acculturative stressors that come up during acculturation. That is, acculturative stress is a physiological and psychological state brought about by acculturative stressors rooted in the process of acculturation (Berry, Kim, Minde, & Mok, 1987). These acculturative stressors are culture-specific, encompassing social, familial, and environmental stressors as well as perceived difficulties across various culture-specific life domains such as language, education, work, and intercultural interactions. There are times and situations in which the cultural changes can be stressful to an acculturating individual.

Nevertheless, as shown in Figure 2.7 below, acculturation does not necessarily result in negative emotions, i.e., negative stress reactions; for instance, rising to a challenge may give

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

a sojourner's personal satisfaction. Many factors moderate the level of acculturative stress such as cultural distance between home and host countries, social support, length of stay in host country, etc. For example, the more social and family support, the lower a sojourner's level of acculturative stress in host country.

As shown in Figure 2.7 below, a proposed conceptual/theoretical framework was constructed based on Lazarus and Folkman's (1984) transactional model of stress, coping, and adaptation, and Berry's (1997) model of acculturative stress, and Lazarus's (1999) revised transactional model of stress and coping.

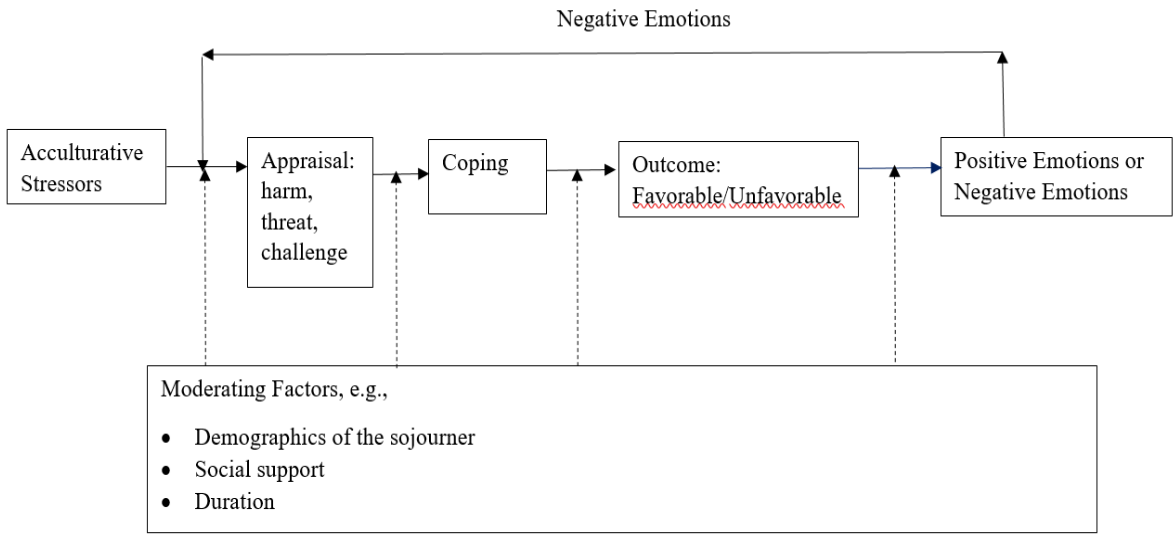

Figure 2.7. A conceptual framework of acculturative stress.

This framework in Figure 2.7 illustrates that during acculturation process, a sojourner encountering acculturative stressors will appraise whether they will bring harm, threat or challenge to him/her. Based on the appraisal results, appropriate coping strategy will be employed to address the stressors, resulting in favourable/unfavourable outcomes which bring about his/her positive/negative emotions. The negative emotions will then be fed back into the acculturation process for his/her further appraisal, i.e., reappraisal. This appraisal-

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

coping-negative emotion-reappraisal process repeats itself, thus producing the conditions of acculturative stress. Moderating factors, such as age, duration of stay, and social support, can affect the sojourner's acculturation process, which in turn impacts his/her level of acculturative stress.

The above framework represents the process model of acculturative stress and underpins this research study. Acculturative stress is a process of interaction between acculturative stressor(s), cognitive appraisal and coping, outcome, and emotions. In this way, acculturative stress is a stress reaction in response to acculturative stressors that come up in the experience of acculturation.

Acculturative stressors in Figure 2.7 could be cross-cultural adjustment problems or difficulties (Lazarus, 1984; Lazarus & Folkman, 1984; Pan, Yue, & Chan, 2010). Many acculturation studies have identified some acculturative stressors experienced by international students in host countries in domains such as language, academic, sociocultural, and financial issues (e.g., Cheung, 2013; Smith & Khawaja, 2011). Upon encountering acculturative stressors, the sojourner appraises the relevance and significance of that encounter to him/her, i.e., how the sojourner gives meaning to the stressors. When the acculturative stressors are appraised to be problematic (i.e., harm, threat, or challenge) because of its relevance and significance (i.e., person-environment relationship), coping process will be initiated to tackle these stressors by way of problem-focused, emotion-focused, avoidance-oriented, or meaning-focused coping (Folkman, 2008; Lazarus, 1999; Lazarus & Folkman, 1984; Berry, 1997). If a sojourner can cope with the stressors through various coping resources, positive emotion will end up; otherwise, negative emotion (i.e., distress) will result. Like those in Berry's (1997) model of acculturative stress, moderating factors such as demographic factors

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and social support can affect the level of acculturative stress experienced by the sojourner through influencing the relationship between the events.

2.7 Existent scales for measuring acculturative stress of international students

As shown in sections 2.4 and 2.5 above, mainland Chinese students in Hong Kong are vulnerable to acculturative stress. To assist these students to rise to the challenge and identify their stressors, an initial move is to construct a culturally suitable assessment instrument to gauge their levels of stress. As indicated in Appendix 2, there are five scales of acculturative stress relevant to international students, especially mainland Chinese students. The following section will discuss them.

2.7.1 Acculturative Stress Scale for International Students (ASSIS)

Developed by Sandhu and Asrabadi (1994) (see Appendix 3), ASSIS is the earliest and most popular scale among the five scales. ASSIS consists of 36 items on 7 factors, which are perceived discrimination (8 items), homesickness (4 items), perceived hate/rejection (5 items), fear (4 items), stress due to change/culture shock (3 items), guilt (2 items), and non-specific/miscellaneous (10 items). All statements of ASSIS were randomly presented. The response format is based on 5-point Likert scale ranging from 1 as strongly disagree to 5 as strongly agree with 3 as not sure. The higher score on an item, the higher acculturative stress perceived by the respondent. The total score ranged from 36 to 180. ASSIS demonstrated a very high measure of reliability: The internal consistency, i.e., the Cronbach's alpha coefficient, of the 36 items was .95 and the Guttman split-half statistic was .97 with .94 as the correlation between halves (Sandhu & Asrabadi, 1998). The mean score and standard deviation of ASSIS were 66.32 and 21.16 respectively; a score higher than 109, i.e., 2 standard deviations from the mean score, was considered a cutoff point for counseling and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

psychological intervention (Sandhu & Asrabadi, 1998). Sandhu and Asrabadi (1998) suggested that ASSIS should be served as a screening, rather than clinical, tool since identification of psychiatric symptomatology needs much more meticulous evaluation.

According to the article published by Sandhu and Asrabadi in 1998, 29 studies were using ASSIS at that moment. Nevertheless, based on the literature search from electronic databases of Scopus and Web of Science as at 18 January 2017 using 'Acculturative stress scale for international students' as search keyword (see Appendix 4), a handful of 6 peer-reviewed journal articles have reported to adopt ASSIS to assess the acculturative stress of international students since 1994. Only one of these 6 articles focused on measuring the level of perceived acculturative stress of Chinese overseas students (from mainland China, Hong Kong or Taiwan) who were enrolled in a Bachelor of Nursing programme in an Australian context, reporting a high internal consistency reliability of the ASSIS with a Cronbach's alpha coefficient of .95 (He, Lopez, & Leigh, 2012). Four other articles covered the use of ASSIS to gauge acculturative stress of international students with different nationalities sojourning in Germany, China, and the United States. One other article studied the stress and health-related quality of life of Nepalese students pursuing their studies in South Korea. In Akhtar and Kröner-Herwig (2015)'s study of international students in Germany, a modified version of ASSIS with 41 items (2 original items being deleted and 7 newly-added items) instead of 36 items was constructed and had a high Cronbach's alpha coefficient of .95. Results of the study revealed that homesickness, non-specific concerns, and culture shock were the top three stressors whereas guilt and fear were the least two stressors (Akhtar & Kröner-Herwig, 2015, p. 808). Based on the same set of data, the two articles studying acculturative stress of international students in mainland China found that ASSIS also attained a high Cronbach's alpha coefficient of .93 (Liu, Chen, Li, Yu, Wang, &

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Yan, 2016; Yu, Chen, Li, Liu, Jacques-Tiura, & Yan, 2014). The items of ASSIS remained the same, but the factors grouping these items were different, as opposed to those in the original ASSIS of Sandhu and Asrabadi (1994). In Bhandari (2012)'s study of Napalese students in South Korea, the findings showed that they experienced substantial amount of perceived acculturative stress, which was negatively related with their the health related quality of life. The Cronbach's alpha coefficient for ASSIS was .9, an indicator of a high level of reliability. In Chavajay and Skowronek (2008)'s study of international students in a university in the United States, the Cronbach's alpha coefficient of ASSIS with a value of .91 was also very high. All the above empirical studies showed that ASSIS was a reliable scale of acculturative stress for international students in various countries, though it was developed in the United States context.

Nevertheless, the obvious drawback of ASSIS is that the instrument is an English one. The items of ASSIS could be misunderstood by mainland Chinese students owing to their probably different interpretations of English words. Although the main purpose of most international students to go overseas is to further their studies, academic stressors being one of the common challenges to international students in literature (e.g., Cheung, 2013) were excluded from ASSIS. ASSIS also lacks items arising from stresses in host countries such as finance (e.g., Cheung, 2013), accommodation, and weather. Accommodation is a common problem to many Hong Kong residents, let alone international students. The weather in Hong Kong is very hot and humid in summer; students coming from the northern China may find it hard to adapt. Furthermore, ASSIS treats international undergraduate and postgraduate students as an entire group in the target respondents. Hence, within-group differences between these two groups of international students are neglected.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2.7.2 Index of Life Stress (ILS)

Unlike ASSIS, ILS (see Appendix 5) was designed for the Asian international students, rather than general international students. Although Yang and Clum (1995) did not mention the educational level of the target respondents, it is highly likely that the target respondents are Asian undergraduate students in the United States because the original respondents of ILS were students in the Introductory Psychology course. ILS consisted of 31 statements under 5 factors: (1) concern about finance and desire to stay in the U.S., (2) language difficulties, (3) interpersonal stress, (4) stress from new culture and desire to return to one's own country, and (5) academic pressure. The response format is based on a 4-point Likert scale ranging from 0 (never) to 3 (often). The higher the total score, the higher the level of life stress. The sample for validating the ILS was a group of 101 international students born in Asia and studying at a Southeastern university in the United States. Based on the Kuder–Richardson Formula 20 ("KR-20"), the internal consistency estimate of the ILS was reported to be .86 ($n = 101$). Moreover, 20 participants of the total sample were randomly chosen to complete ILS one month later to examine its test-retest reliability to ensure its stability. These 20 participants returned and completed the ILS again. The test-retest reliability of the ILS within one-month interval was found to be .87 ($n = 20$), indicating a good reliability and stability. The concurrent validity of the ILS was $r(100) = -.46$, $p < .0001$, measured by the correlation between the ILS and the Life Experience Survey ("LES"; Sarason, Johnson, & Siegel, 1978) which is a 57-item self-report measure of life stress of the general population. The incremental validity of ILS was examined by conducting hierarchical regression to confirm that the ILS added significantly to the prediction of depression and hopelessness beyond that provided by the LES. The construct validity in the ILS was investigated by way of factor analyses to ascertain 5 factors, i.e., the abovementioned 5 areas of stress. All these

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

satisfactory psychometric properties apparently revealed that the ILS might be a valid measure of acculturative stress for Asian international students in the United States.

Nonetheless, based on literature search from electronic databases of Scopus and Web of Science as at 5 February 2017 using "Index of Life Stress" as search keyword, no other further study has been conducted to empirically examine the validity and reliability of ILS on international students since its inception in 1995. Like ASSIS, ILS was developed in the United States context and was an English instrument, which might create language and validity problems, because the participants in the study were Asian international students whose mother tongues were not English. In addition, the Asian international students were treated as an entire group, rather than mainland Chinese students only; within-group differences among Asian international students were not addressed. Also, the criterion measures of adjustment in the study, such as Zung's Depression Scale (Zung, 1965), Beck Hopelessness Scale (Beck, Weissman, Lester, & Trexler, 1974), and Modified Scale for Suicide Ideation (Miller, Norman, Bishop, & Dow, 1986), were not normed on Asian international students, and the correlations between ILS and these criterion measures of adjustment were .21 to .41, low to moderate though statistically significant with $p < .05$ (Yang & Clum, 1995). Moreover, ILS does not differentiate acculturative stress from general stress, and assesses the level of stress experienced by Asian international students as a whole. The authors suggested that language difficulties resulted in the observed differences between their sample and normative data on American college samples could be more likely attributed to the acculturative stress which Asian international students combated on top of everyday life stress shared by American domestic students. However, no normative data of American college students were available from the authors, and no statistical test were conducted to investigate whether the observed differences were statistically significant; as a result, the ILS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

may not be an appropriate instrument to measure acculturative stress of Asian international students in the United States (Bai, 2012). It is also doubtful whether ILS is suitable for measuring acculturative stress of mainland Chinese undergraduate students in Hong Kong.

2.7.3 Acculturative Hassles Scale for Chinese Students (AHSCS)

Developed by Pan, Yue, and Chan (2010) (see Appendix 6) in Hong Kong context, AHSCS is a 17-item Chinese, rather than English, scale with four factors: language deficiency, academic work, cultural difference, and social interaction. Pan, Yue, and Chan (2010) used hassles instead of life-event stressors because hassles, as micro-stressors or relatively minor everyday stresses, are 'the irritating, frustrating, distressing demands that to some degree characterize everyday transactions with the environment' (Kanner, Coyne, Schaefer, & Lazarus, 1981, p. 3) in the context of acculturation. Kanner, Coyne, Schaefer, and Lazaus (1981) found that hassles scale 'was a better predictor of concurrent and subsequent psychological symptoms than' was life-event stressors scale (p. 1) because cumulative effect of hassles could be very stressful.

For the total score of AHSCS, the Cronbach's alpha and Guttman split-half reliability were .88 and .86 respectively, revealing a satisfactory internal consistency reliability (Pan, Yue, & Chan, 2010). Pan, Yue, and Chan (2010) also reported the Cronbach's alphas for the four subscales: .81 for language deficiency, .74 for academic work, .76 for cultural difference, and .74 for social interaction. In addition, convergent validity was attained by correlating AHSCS with two criterion measures: Chinese Affect Scale (CAS; Hamid & Cheng, 1996), and Satisfaction with Life Scale (SLS; Diener, Emmons, Larsen, & Griffin, 1985). The total score of AHSCS and the scores of its four factors exhibited a statistically significant positive correlation with negative affect subscale of CAS, and a statistically

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

significant negative correlation with both SLS and positive affect subscale of CAS).

Although AHSCS is a Chinese scale and was developed using a sample of 400 mainland Chinese postgraduate research students pursuing PhD and MPhil degrees in six publicly-funded Hong Kong universities, it is doubtful whether the scale can be equally applicable to mainland Chinese undergraduate students in Hong Kong. Furthermore, two common acculturative stressors in Western instruments or international students' literature are missing in AHSCS: financial concern (e.g., Cheung, 2013; Yang & Clum, 1995), and perceived discrimination (e.g., Sandhu & Asrabadi, 1994; Wadsworth, Hecht, & Jung, 2008). These missing stressors might undermine the content validity of the AHSCS. Pan, Yue, and Chan (2010) explained that the sample did not reflect concern for financial burden because most of the participants in the study were full-time research students who secured full scholarships or stipends to cover their tuition fees and living expenses. However, many mainland Chinese undergraduate students need to pay a hefty non-local tuition fee and meet daily expenses on their own without any scholarships (Xie, 2009). Therefore, finance could be a burden for the mainland Chinese undergraduate students in Hong Kong (Xie, 2009). According to Pan, Yue, and Chan (2010), the absence of perceived discrimination could be attributed to a closer interdependent relationship involving frequent communication and more mutual understanding between two places after the reunification of Hong Kong and mainland China in 1997. However, other studies of mainland Chinese students in Hong Kong (e.g., Yu & Zhang, 2016), and newly-arrived mainland Chinese immigrants in Hong Kong (e.g., Chou, 2012) revealed that perceived discrimination is likely to exist. In any event, studies on perceived discrimination among mainland Chinese students in Hong Kong showed mixed results. Pan, Yue, and Chan (2010) also stated that confirmatory factor analysis should be done in future to confirm the stability of AHSCS's factor structure. Finally, based on

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

literature search from electronic databases of Scopus and Web of Science as at 10 March 2017 using ‘Acculturative Hassles Scale for Chinese Students’ as search keyword, only one study conducted by Pan and Wong (2011) was found to employ AHSCS to compare the levels of acculturative stress experienced by Chinese international students in two cultures—Hong Kong and Australia. Regrettably, the study did not report the reliability of AHSCS in Australian context. Pan and Wong (2011) themselves commented that AHSCS ‘was developed in Hong Kong context for mainland Chinese students. Its application to Chinese international students in Australia needs further validation’ (p. 381). Since the empirical studies on AHSCS are quite few, more research should be performed on its validity and reliability in different cultures and educational levels of mainland Chinese students.

2.7.4 Revised version of Social, Attitudinal, Familial, and Environmental Acculturative Stress Scale-Short Form (RSAFE)

Developed by Suh et al. (2016) (see Appendix 7) as an English self-report stress measure consisting of 2 factors with 10 items of general stress and 3 items of family stress, RSAFE is a revised version of Social, Attitudinal, Familial, and Environmental Acculturative Stress Scale-Short Form (‘SAFE’; Mena, Padilla, & Maldonado, 1987). Based on classifying items into environmental, social, attitudinal and familial factors of stress in Fuertes and Westbrook (1996)’s revised SAFE scale, general stress consisted of less differentiated items drawn from the former three factors of stress, such as racism, interpersonal problems, and homesickness; whereas family stress represented the latter one factor of stress, such as differences between family expectations and one’s values, goals, and decisions. Four hundred sixty-eight international postgraduate students in the United States completed RSAFE three times in two successive semesters. Most of them came from India and PRC; in all, 78% of them were from Asia. Based on “Raykov’s rho (2009), reliability was ρ = .89 (95% CI: .87, .91) for

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

general stress, and ρ = .79 (95% CI: .75, .84) for family stress at Time 1" (Suh et al., 2016, p. 219). Confirmatory factor analyses were conducted to support RSAFE's longitudinal measurement invariance and structural invariance. Within- and across-time correlations between acculturative stress factors and life satisfaction exhibited moderately inverse relations. These psychometric properties suggest that RSAFE could be an effective screening instrument of acculturative stress. However, one drawback of RSAFE was that international students were treated as a single group, since measurement factor structures were not the same when different ethnic groups are compared in other research studies (Suh et al., 2016). Another drawback was that RSAFE was an English scale and developed in the United States with international postgraduate students, its application in assessing acculturative stress of mainland Chinese students in Hong Kong requires further validation. Finally, based on literature search from electronic databases of Scopus and Web of Science as at 11 March 2017 using 'Social, Attitudinal, Familial, and Environmental Acculturative Stress Scale' as search keyword, no other further study was found to empirically examine the validity and reliability of RSAFE on international students, probably because RSAFE is quite a new scale. Therefore, it is doubtful whether RSAFE can be generalized and applied to international students in other countries or regions, such as Hong Kong.

2.7.5 Acculturative Stress Scale for Chinese College Students (ASSCS)

ASSCS, developed by Bai (2016), is a Chinese scale of acculturative stress developed and validated among a sample of Chinese international students in the United States. It is a five-factor scale of 32 items generated by way of exploratory factor analysis from a 72-item pool. The five factors are language insufficiency (10 items), social isolation (8 items), perceived discrimination (7 items), academic pressure (4 items), and guilt toward family (3 items) (see Appendix 8). The 72-item pool was created from existing scales, literature, and in-depth

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

interviews with eight Chinese students in the United States. Only 267 cases out of a nonprobability sample of 607 Chinese students completing an online survey were valid for further data analysis, since either many participants did not fully complete the survey or the patterns of their answers were quite strange such as the same answers to almost all questions (Bai, 2012). Many these participants were in their twenties, single, female, and postgraduate students. Their average age was 26 years old with a standard deviation of 4.04. The average length of their sojourn in the United States was 35 months with a standard deviation of 28.09. Most of the participants were self-financed, rather than PRC-government sponsored, students. ASSCS demonstrated high reliability with an overall Cronbach's alpha of .939. Criterion-validity was investigated by employing the total score of ASSCS to predict participants' depression and life satisfaction (Bai, 2016). The Chinese version of Zung's Self-Rating Depression Scale (Zung, 1965; Lee et al., 1994) was used to measure participants' depression. A question: 'Overall, what is your satisfaction degree with your life in the U.S. as an international student?' was used to measure participants' life satisfaction (Bai, 2016). The outcomes of hierarchical regression supported criterion-related validity for ASSCS, and confirmed that ASSCS was a significant negative predictor of life satisfaction and a significant positive predictor of depression. The associations with the two criterion measurements of depression and life satisfaction corroborated that ASSCS measured acculturative stress. As a result, ASSCS demonstrated satisfying psychometric properties of a measurement instrument.

Four factors of ASSCS were consistent with previous literature of international students concerning acculturation and acculturative stress: language insufficiency (e.g., Andrade, 2006), social isolation (e.g., Sawir, Marginson, Deumert, Nyland, & Ramia, 2008), perceived discrimination (e.g., Poyrazli & Lopez, 2007), and academic pressure (e.g., Zhou,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Christopher, & Bang, 2011). By contrast, the fifth factor, guilt toward family, was uniquely identified in ASSCS. According to Bai (2016), guilt toward family actually were related to the two factors of homesickness and guilt in ASSIS developed by Sandhu and Asrabadi (1994). Homesickness refers to 'a feeling of longing for one's home during a period of absence from it' (Homesickness, 2017). Guilt refers to 'a feeling of having committed wrong or failed in an obligation' (Guilt, 2017). Culturally, guilt toward family is a sensible stressor for Chinese students during their sojourns in the United States, because filial piety is an essential Chinese traditional cultural value that adult children have duty to look after senior members and nurture the young in their families (Zhang, 2013). Since these Chinese students left their families and came to the United States to further their studies, filial piety was apparently infringed, resulting in a feeling of guilt among them (Bai, 2016).

On the other hand, two factors commonly found in previous literature of international students as to acculturation and acculturative stress were missing in ASSCS: financial difficulty (e.g., Le & Gardner, 2010), and cultural difference (e.g., Andrade, 2006). Bai (2016) explained that the absence of financial difficulty could be attributed to the fact that over 65% of the postgraduate students in the study received scholarships from their attending institutions, and over 97% of the undergraduate students were financially supported by their families. Since the implementation of economic reforms in 1978, PRC's economic growth has grown steadily to make her become the world's second largest economy in 2010 in terms of nominal GDP (Yin, 2013). Owing to economic boom and increase in personal income, many PRC's middle-class families could afford their children to study overseas (Yin, 2013). Moreover, because of the PRC's one-child policy in the past several decades, many parents were willing to spend more resources on their children's education (Yin, 2013). Hence, financial concern was not a great issue for many Chinese students in Bai (2016)'s study,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

which fell in line with the result of Pan, Yue, and Chan (2010)'s study in Hong Kong. In contrast, being the common stressor in literature of international students in the acculturation process (e.g., Le & Gardner, 2010), financial adjustment was found to be one of top four challenges of mainland Chinese students studying in Hong Kong (Cheung, 2013) because of high living costs and tuition fees there. The other missing factor in ASSCS was cultural difference. According to Bai (2016), there might be two reasons for such absence in ASSCS. First, globalization blurred the borders of different cultures; participants already acquired the knowledge of American culture in the PRC through mass media (Bai, 2016). Second, instead of cultural differences being a single factor in ASSCS, issues related to cultural differences might be incorporated in other factors in ASSCS, e.g., academic pressure, social isolation, and perceived discrimination (Bai, 2016). By contrast, cultural difference appeared in ASSIS as stress due to change/culture shock, and AHSCS as cultural difference. Moreover, 89 percent of mainland Chinese students in Hong Kong surveyed in Cheung (2013)'s study replied that one of the main reasons why they did not mingle with local students was cultural difference, a frequent stressor in literature of acculturation and acculturative stress (e.g., Ying, 2005). Hence, it is questionable whether cultural difference should be a stress factor for mainland Chinese undergraduate students in Hong Kong.

The strength of ASSCS lied in the fact that ASSCS was basically a Chinese scale and data collection was also conducted in Chinese to make Chinese students easier to express themselves and respond to the survey, resulting in reducing construct bias and enhancing the validity of ASSCS (Bai, 2012). Also since ASSCS had both Chinese and English versions, it could be used by participants with single language mastery (Bai, 2016). Apart from incorporating some typical acculturative stressors, ASSCS had a unique factor, guilt toward family, that was closely related to filial piety in traditional Chinese culture, and One-Child

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Policy in PRC's population policy (Bai, 2016).

However, ASSCS has several shortcomings. First, since nonprobability sampling was adopted to develop ASSCS in Bai (2016)'s study, it was doubtful whether the sample was a genuinely representative one. Second, as ASSCS was a new scale, more empirical studies should be conducted to assess its psychometric properties; confirmatory factor analysis should also be used to establish the stability of the existent five-factor structure (Bai, 2016). Third, ASSCS treated Chinese international undergraduate and graduate students as an entire group in the target respondents. Hence, within-group differences between these two groups of Chinese international students are neglected. Also, Bai (2016) did not elaborate on whether the Chinese international students in her study included Chinese international students from mainland China only, and excluded those from Taiwan, Hong Kong, and Macau. Fourth, although ASSCS was in Chinese and developed for Chinese international students pursuing undergraduate and postgraduate studies in the United States, it is uncertain whether the scale can be generalized and applied to mainland Chinese undergraduate students in other areas, such as Hong Kong.

2.8 Characteristics of the proposed scale

In light of inappropriateness in the abovementioned five scales measuring acculturative stress such as the United States rather than Hong Kong context, questionnaire in English rather than Chinese, sample of mainland Chinese research postgraduate rather than undergraduate students, sample of mainland Chinese both undergraduate and postgraduate students as a whole rather than sole undergraduate students, and dubious factors of financial concern, perceived discrimination, and cultural difference, this study will design an acculturative stress scale for mainland Chinese undergraduate students in Hong Kong. First, the proposed scale

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

could be considered innovative since no such scale is available yet. Second, this study will address whether domains of financial concerns, perceived discrimination, and cultural differences should be included in the proposed acculturative stress scale for the Chinese undergraduate students in Hong Kong, because the inclusion of these domains in previous five scales was inconsistent. Third, all the previous five scales were obtained using factorial methods in classical test theory. This study adopted Rasch analysis, a modern measurement method, to construct an instrument to measure acculturative stress by transforming ordinal scores into interval measure.

2.9 Rasch analysis rather than factor analysis

The construction of acculturative stress scales for international students such as ASSIS, ILS, AHSCS, RSAFE, and ASSCS were basically guided by theory, and their psychometric properties were determined by means of factor analysis. Although factor analysis has been commonly used to identify the underlying factors present in a set of measured variables, Wright (1996) mathematically demonstrated that Rasch analysis was preferable to factor analysis for reducing complicated data matrices to unidimensional variables; moreover, factor analysis mistakes 'ordinally labeled stochastic observations for linear measures' and fails 'to construct linear measurement' (p. 3). By contrast, Rasch analysis assesses individual item characteristics while placing item difficulty (i.e., how much acculturative stress it represents) and person ability (i.e., a person's level of the acculturative stress being measured) on the same linear scale. A Rasch analysis of the data explores where participants' levels of acculturative stress are along a continuum from low to high, given the range of item difficulty. Therefore, Rasch analysis, rather than factor analysis, is adopted in this study.

Historically, as a significant 'methodological resource' to guide research in psychology for

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

more than seventy years, Stevens's (1946) theory of scales of measurement 'advanced the representational theory of measurement and promised to open up to scientific investigation the issue of the structure of psychological attributes' (Michell, 2002, p. 99). Measurement was considered 'the assignment of numerals to objects or events according to rules' (Stevens, 1946, p. 677) 'as a means of representing their studied properties' (Raykov & Marcoulides, 2011, p. 1). To allow for 'description to pass as measurement', this definition is arguably problematic because it assumes that if a rule is complied with, 'any number obtained from (or assigned to) response(s) to a question or set of questions can measure' a desired attribute (Rebesco, 2011, p. 24).

To follow the same principles of measurement in natural sciences, the use of objective abstractions of equal units along a hierarchy to quantify a unidimensional construct should be adopted (Bond & Fox, 2007). An objective measure must be independent of the participant (i.e., the measure must be reproducible and invariant) (Bond & Fox, 2007). Participants who receive the same acculturative score on the measure should have similar levels of acculturative stress, regardless of who they are and where or when they are measured.

Similarly, the difficulty of an item (i.e., how much acculturative stress it represents) on the measure should be the same regardless of the sample tested. Items that are only endorsed by high acculturative stress participants from one sample should not be endorsed by participants from another sample of the same population who are only moderate acculturative stress. Using factor analysis, levels of acculturative stress and difficulty of items are both sample-dependent. For instance, measures established in this manner allow one to identify those participants who show Y amount of acculturative stress in each sample, therefore it is possible to describe their level of acculturative stress in relation to their members in the same

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

cohort. Nevertheless, Y amount of acculturative stress has no objective meaning. In contrast, Rasch analysis creates objective abstractions that are sample-free (Bond & Fox, 2007).

Rasch analysis tackles equal units neglected by factor analysis. For instance, many measures of acculturative stress are scored by adding the raw scores of responses on a Likert scale, making up an overall score to indicate the level of acculturative stress. These data are then treated as interval level for statistical analyses, even though they are in fact ordinal level. This is problematic in that measurement requires interval level data (i.e., they should be additive). When one more unit of acculturative stress is added to the scale, it should add the same amount, regardless of how much there is originally (Rebesco, 2011).

Rasch analysis provides a means to construct a scientific measure of behaviour by transforming raw data into objective abstractions of equal interval units and evaluating the extent to which measure performance adheres to the model of a unidimensional, hierarchical construct. Statistical feedback is given to the overall measure adherence to the Rasch model as well as at an item level, person level, and rating scale category level of adherence to the Rasch model. By identifying specific aspects of the measure that deviate from the Rasch model, modifications are subsequently performed to enhance reliability and validity of the measure.

Rasch procedure involves transforming raw data into objective abstractions. Typically, Winsteps software is employed to perform the data transformation and analysis. First, raw scores are obtained for both item difficulty and person ability by calculating the proportion of the actual score to the maximum possible score (Bond & Fox, 2007). Nonetheless, these raw scores are insufficient to construct the measure, since raw score distributions tend to

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

minimize the differences between the scores in the middle of the distribution, while exaggerating the differences between the scores in the tails of the distribution. To tackle this problem, a log odds transformation is applied to the raw scores (Bond & Fox, 2007). Although the relative placements of the item difficulty and person ability scores are the same for both the raw data and the transformed data, the distances between the transformed scores are established using equal interval units. The transformed item difficulty and person ability scores are then used to obtain residuals calculated from the difference between the actual and expected scores for each person (and item). These residuals are then used to identify deviations from model expectations, at a specific item- and person-level that is unavailable in classical test methods.

The following chapter 3 on methodology will lay out research tasks to establish an acculturative stress scale for mainland Chinese undergraduate students in Hong Kong.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Chapter 3: Methodology

3.1 Research design

The purpose of this study is to develop a measurement instrument, namely, Acculturative Stress Scale for Mainland Chinese Undergraduate Students in Hong Kong (ASSMCUS), and analyse its psychometric properties using Rasch method. In order to meet this purpose, the following research steps were taken:

Firstly, a 114-item pool, as shown in Appendix 9, was generated from literature and existing scales related to acculturation and acculturative stress of mainland Chinese international students. The sources of literature included, but not limited to, international journal articles, doctoral dissertations, newspaper columns, magazine articles, and YouTube and video clips of mainland Chinese students in Hong Kong; existing scales mentioned in Section 2.7 of Chapter 2 were presented in Appendices 3, 5, 6, 7, and 8.

Secondly, eight mainland Chinese undergraduate students (six females, two males) were invited, through researcher's visits to various campuses, to attend in-depth interviews to elaborate on their adjustment difficulties and stressful occasions they had encountered during their sojourns in Hong Kong (see Table 3.1). The goal of these interviews was to identify any missing item or dimension that had not been covered by the 114-item pool. In addition, the items in the proposed scale, as opposed to other scales, were adapted to the local situation. It is common "to study a few individuals or a few cases" (Creswell, 2011, p. 209) through in-depth interviews, rather than focus groups interviews, to let participants speak up their minds freely about their individual, possibly embarrassing, difficulties which they may feel uncomfortable discussing in a focus group.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 3.1

Participants of individual in-depth interviews

Name	Gender	Age	Major	University	Length of stay in HK	Origin	Finance support	Place of residence
C	Female	21-25	Computing Mathematics (4th year)	CityU	3 years	Zhejiang	Family and scholarship	On campus (1st to 4th years)
D	Female	21-25	Chinese language (5th year)	EdUHK	4 years	Tianjin	Family	On campus (1st to 5th years)
Y	Female	16-20	Electronic engineering (1st year)	CityU	1 month	Hebei	Family and scholarship	On campus (1st year)
X	Female	16-20	Mathematics and Statistics (2nd year)	BU	1 year	Xin Jiang	Family	On campus (1st year), off campus (2nd year)
Z	Male	16-20	Chemistry (1st year)	HKU	1 month	Inner Mongolia	Family	On campus (1st year)
S	Male	16-20	Mathematics (1st year)	HKU	1 month	Inner Mongolia	Family	On campus (1st year)
Q	Female	16-20	Chinese language (3rd year)	LU	2 years	Beijing	Family	On campus (1st to 3rd years)
P	Female	16-20	Computer Science (3rd year)	CUHK	1 month	Henan	Family	On campus (3rd year)

Note. Z and S came and participated in the same interview together.
P is a student coming from Sun Yat-sen University in Guangzhou, China after completing her two years of computer science study over there, to carry on her last two years at the Chinese University of Hong Kong, Hong Kong.
The abbreviations under university column are as follows: CityU for City University of Hong Kong, EdUHK for The Education University of Hong Kong, BU for Hong Kong Baptist University, HKU for The University of Hong Kong, LU for Lingnan University, and CUHK for The Chinese University of Hong Kong.
These individual interviews were held from late September 2017 to early October 2017.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

The native language of all participants was Mandarin. Venues of interviews were quiet places, e.g., library discussion room, on participants' campuses. Although an individual interview guide (see Appendix 30) was used in the interviews, the participants were encouraged to recount their life experiences whenever possible. Each interview lasted about one hour, and were conducted in English, which was the common language between the participants and the researcher (i.e., interviewer). Nevertheless, Mandarin was sometimes used in the interviews. With the approval of the participants, all interviews were audio-taped to facilitate the transcription of them. Pseudonyms were used instead of their real names. Through content analysis of the transcribed interviews, 91 new items were added to, and 33 old items were discarded from the 114 item pool to result in a 172-item questionnaire (see Appendices 13 and 14). For example, a new arrival, P, responded to whether she encountered discrimination as follows:

> On campus, I do not feel discrimination by teachers and classmates; in fact, they are quite nice. However, junior staff like cleaners sometimes show disrespect to me.

Another new arrival student, S, said

> I feel a bit discriminated. In university canteen, when I spoke to waitress in Cantonese for more rice, I would be given a bit more. However, when I spoke to her in Mandarin, she ignored my request.
>
> On the other hand, discrimination may not only come from local students but also from mainland Chinese students because they know where you were from, and which school you attended.

The other two students who stayed in Hong Kong for a couple of years did perceive some sort of discrimination even though they did not encounter it personally. D replied

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

> I do not experience discrimination such as hatred speech on me or teasing my mainland China cultural value/norm. … I heard that some mainland Chinese on the MTR was scolded to return to mainland China. I also observed some criticisms or verbal attacks on mainland Chinese on the Internet.

C remarked

> Not now, but before. About 3 years ago, i.e., 2014, when I first entered CityU, there was Umbrella Movement. I felt discriminated, though not directing at me personally, because at that time, the atmosphere was against mainland Chinese. Recently the topic of Hong Kong independence has been quite hot. I do not care about what people talked about it. I know that it is just their opinions, not a reality. Even if it became a reality, she thought that it would not have affected me. In the past, when she lived in mainland China, she did not feel stressed. Therefore, even if Hong Kong became an ordinary city of mainland China and Hong Kong would have been under one country one system, I would not feel stressed either but would feel sad about Hong Kong.

As a result, an item with number of 77 in Appendix 9, "I feel discriminated toward me from professors" was removed from the item pool, but an item with number of 112 in Appendices 13 and 14, "In tertiary institutions, I feel discriminated against." was added. Also, as S said above that discrimination may come from mainland Chinese students themselves because they know where the conational was from and which school he or she attended, an item with number of 110 in Appendices 13 and 14, "As mainland Chinese students come from different regions of mainland China. I feel that some of mainland Chinese students discriminate against me.", was added.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Concerning study stress, P replied that

> The teaching mode in Hong Kong resembles that of Western countries---teachers are flying in the sky, and students are running on the ground (教师在天上飞，学生在地面跑). Teachers in Hong Kong go through the lecture content briefly; students need to study more on the topics by themselves after class. In mainland China, teachers have a closer relationship with them, and take care of their progresses more. My 15 classmates coming from Sun Yat-sen University and I come under more pressure to study in Hong Kong. Nonetheless, this way of learning can make her become more independent in learning, instead of relying on teachers very much.

Another students S and Z echoed similarly,

> S: In mainland China, teachers teach you the knowledge of science and give you a lot of problems to solve. Here in Hong Kong, teachers only tell you to find your own topic to do and give a presentation on that topic later on; such learning mode is not common in mainland China.
>
> Z: I agree with Steven that [in Hong Kong,] a student needs to think about the question/problem first and has to do everything by himself/herself, and sometimes he/she does not know where to start, what materials he/she should find, and gradually he/she will feel very stressed.
>
> S: I do not like this way of learning for the time being, but perhaps later when I gets accustomed to it, I may like it. Although the answers to the problem in mathematics and chemistry, unlike social science subjects, are quite clear-cut, the atmosphere and approach to learning is different.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

In light of the above remarks concerning study stress, an item number with number 45, “Independent, autonomous, and pro-active learning.” was added.

Moreover, the 172 items were reorganized into 11 relevant dimensions (i.e., themes), namely, English barrier, Cantonese barrier, Study stress, Cultural differences, Social interaction, Career prospects, Accommodation, Discrimination, Homesickness and family, Finance, and Other life stresses.

Thirdly, another seven mainland Chinese undergraduate students (6 females, 1 male) in Hong Kong were recruited, through posting a recruitment message on mainland China’s social media, WeChat, with the assistance of researcher’s mainland Chinese schoolmate, to participate in a focus group interview. The main purpose of the focus group interview was to solicit the participants’ collective views on the content, format, readability, and comprehensiveness of the questionnaire. The reason for having a group of seven was that optimal focus group size in a “noncommercial topic is six to eight” participants (Krueger & Casey, 2000, p. 73); anything larger would probably curtail responses because participants could have a feeling of unease to discuss matters in front of a large group, whereas anything much smaller would make such interview become an in-depth one.

All seven participants (see Table 3.2) came from the Education University of Hong Kong, for the sake of facilitating to arrange a common place and time to meet. Pseudonyms were used instead of their real names. Their sojourns in Hong Kong were solely supported by their families. They all lived on the university’s campus dormitories. Within their walking distance, the venue of the focus group interview was the meeting room of the Graduate School office. A focus group interview guide (see Appendix 31) was adopted in the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

interview. Nonetheless, participants could express their views whenever possible. The native language of all participants was Mandarin, but one of the participants, R, who came from Guangzhou, could speak fluent Cantonese as well. The entire meeting lasted about one and a half hour, and were conducted in English, which was the common language between the participants and the researcher (i.e., interviewer). In the first thirty minutes, participants were required to attempt a survey that includes the tentative 172-item ASSMCUS, criterion measurements, overall remarks, and demography, and rendered their comments in the subsequent one-hour focus group interview. Considering their feedbacks, only change to presentation layout of the 172-item ASSMCUS was made, i.e., displaying the options to items horizontally rather vertically. For other comments, no unanimous consent has been reached; for instance, suggestions about combining items with numbers 8 and 9 were not considered because English TV programs and radio programs are two different media that affect people's understanding the content of respective medium differently. Eventually, an online survey containing the final 172-item ASSMCUS was produced and shown in Appendix 32.

Table 3.2

Participants of focus group interview

Name	Gender	Age	Major	Length of stay in HK	Origin
R	Female	16-20	Psychology (2nd year)	1.5 year	Guangdong
T	Male	21-25	Greater China Studies (4th year)	3.5 years	Shandong
J	Female	21-25	Early Childhood Education (3rd year)	2.5 years	Shaanxi
M	Female	16-20	Primary - Mathematics Education (2nd year)	1.5 years	Zhejiang
N	Female	16-20	Primary - Mathematics Education (2nd year)	1.5 years	Liaoning

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

G	Female	16-20	Music (1st year)	0.5 year	Jiangsu
B	Female	16-20	Visual Arts (1st year)	0.5 year	Beijing

Note. This focus group interview was held at 8:30 pm on 25th January 2018.

Fourthly, the online survey was distributed to target participants to collect data through various means, for example, emails, researcher's visits to various campuses, postings on social media, and the Mainland Chinese Students and Scholars Associations (CSSA) at various local tertiary institutions.

Finally, after data collection, psychometric properties of the ASSMCUS were analysed using Rasch method. Moreover, convergent validity of the ASSMCUS was examined.

3.2 Sampling and size

For online survey, full-time mainland Chinese undergraduates in Hong Kong were recruited from the eight publicly-funded university, namely, The University of Hong Kong, The Chinese University of Hong Kong, The Hong Kong University of Science and Technology, City University of Hong Kong, The Hong Kong Polytechnic University, Hong Kong Baptist University, Lingnan University, The Education University of Hong Kong; and three private tertiary institutions, namely, Shue Yan University, The Open University of Hong Kong, and Chu Hai College of Higher Education.

Convenience sampling, rather than probability sampling, was adopted because of the researcher's easy accessibility to the target participants, and the absence of a complete list of all full-time mainland Chinese undergraduate students in Hong Kong. Moreover, as this doctoral research study was self-funded, the top priorities in sampling strategy were

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

feasibility and availability of sample data (Bai, 2012). Availability of sample data was basically attributed to (1) the researcher's feasibility to reach out to prospective participants and (2) their convenient Internet accessibility to the online survey.

Kubinger, Rasch, and Yanagida (2009) recommended that sample size of Rasch model should be "no less than 200" (p. 371). The online survey data collection took place from February through March 2018. A total of 282 participants filled out the survey, mainly through researcher's visits to various campuses, because the other means of data collection did not work out well. For data cleansing and demography of the sample data, please refer to Sections 4.1 and 4.2 in Chapter 4.

3.3 Instrumentation

The online survey, containing ASSMCUS and other well-established scales for convergent validity, started with an introduction encompassing purpose and general information of this survey as well as participant's right and approval to participate in this study. Following the introduction, the survey was divided into five sections. The first section contained 172 question items of ASSMCUS related to various aspects of challenges or difficulties during sojourn in Hong Kong, such as English barrier, and Cantonese barrier. The items were rated on a 5-point Likert scale ranging from 1 to 5, where 1 (Not at all stressful), 2 (To a small extent stressful), 3 (Somewhat stressful), 4 (To a large extent stressful), and 5 (Completely stressful). If an item does not apply to a participant, he/she could pick "9 (Not applicable)". "Not applicable" responses of an item were not analysed in this study. Items were scored such that a higher score implied a higher level of acculturative stress. Content validity of ASSMCUS was warranted because items of ASSMCUS were basically constructed from the literature and existent scales of acculturative stress, as well as in-depth individual interviews

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and focus group interview with mainland Chinese undergraduates in Hong Kong. Internal consistency, in terms of item separation and item reliability, would be used to examine reliability of ASSMCUS.

The second and third sections included two scales to assess the convergent validity of ASSMCUS, namely, Chinese Affect Scale (CAS; Hamid & Cheng, 1996), and Satisfaction with Life Scale (SLS; Diener, Emmons, Larson, & Griffin, 1985) to see whether ASSMCUS was related to CAS and SLS. Developed as a measure of negative and positive affect for Chinese-speaking people, CAS consists of 20 items and 2 subscales: Positive Affect Subscale (PAS) and Negative Affect Subscale (NAS). PAS contains 10 positive affect items, e.g., happy, peaceful, and content, and NAS contains 10 negative affect items, such as sad, depressed, and helpless. PAS was found to be significantly positively correlated with extraversion, positive self-appraisal, optimism, and self-esteem, whereas NAS was found to be significantly positively correlated with neuroticism, negative self-appraisal, stress, and pessimism (Hamid & Cheng, 1996). Items are rated on a 5-point Likert scale (1=not at all or very slightly, 2=slightly, 3=moderately, 4=very, and 5=extremely). There were two samples in Hamid and Cheng's (1996) study: a sample of university students and a sample of adults never attending university; these participants indicated how they had felt in the past month. For the student sample, the Cronbach's alpha coefficient for NAS and PAS were .83 and .87 respectively. For the adult sample, the Cronbach's alpha coefficient for NAS and PAS were .88 and .90 respectively. The two-week test-retest reliability for NAS and PAS were .75 and .78 respectively, and the one-month test-retest reliability for NAS and PAS were .71 and .67 respectively (Hamid & Cheng, 1996). SLS, consisting of five items to measure global life satisfaction, has been validated among the Chinese student population (Sachs, 2003). The items are rated on a 7-point Likert scale: 1 (strongly disagree), 2 (disagree), 3

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

(slightly disagree), 4 (neither agree nor disagree), 5 (slightly agree), 6 (agree), and 7 (strongly agree). Scores could range from 5 to 35, with higher scores indicating greater satisfaction with life. The scale has been validated among Hong Kong students pursuing master of education in a Hong Kong university (Sachs, 2003) and mainland Chinese research postgraduate students in Hong Kong (Pan, Yue, & Chan, 2010). The Cronbach's alpha coefficient and the Guttman split-half reliability were .91 and .86 respectively; the average inter-item correlation was .67, lying between .59 and .87 in the study of Pan, Yue, and Chan (2010). In this study, if convergent validity existed, ASSMCUS would show a positive association with positive dimensions of psychological well-being (i.e., positive affect and life satisfaction) and a negative association with negative dimension of psychological well-being (i.e., negative affect).

The fourth section concerned participants' overall satisfaction of their learning and living experiences in Hong Kong, as well as their intention to stay in Hong Kong upon graduation and whether they regret coming to Hong Kong to pursue their studies. The fifth section was about participants' demographic information such as gender, university being attended, length of their stay in Hong Kong, and so on.

3.4 Ethical issues

Ethical clearance was obtained from the Human Research Ethics Committee ("HREC") at The Education University of Hong Kong (see Appendix 12). As this study involved in-depth interviews, focus group interview, and online survey, participants would virtually bear no risk.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Confidentiality of data collected from this study would be strictly observed. No individual data would be disclosed to any third party beyond researcher, his doctoral dissertation supervisors, his doctoral research committee members, HREC, and personnel/institutions as required by law. Future scientific presentations and publications would not contain personal identifiable data. Results for the cohort of participants were presented in aggregate.

For in-depth interviews and focus group interview, a Consent Form and Information Sheet for Participants (see Appendix 28) stating the purpose of the study and the participants' rights as well as seeking their approval to join the interview, was given to them before interviews started. Pseudonyms rather than participants' real names were used to safeguard their identities while reporting the qualitative results. All interviews were conducted in quiet places or rooms on university campuses so that the participants' privacy was safeguarded. At the end of the interviews, participants were given HK$40 for sharing their acculturation experiences and views.

For online survey, its first page stated the purpose of this study, the participants' rights, and their acts of filling it out constituting tacit consent to participate in this study (see Appendix 29). To motivate mainland Chinese undergraduates to participate in the online survey, reinforcement was given in the form of a lucky draw with a chance to win one of 100 supermarket coupon prizes of HK$50 each. If they were willing to join the lucky draw, they were required to render their email address and student ID card number towards the end of the online survey. These limited personal identifiable data were collected only for making payments to participants. Otherwise, participants were assured total anonymity. All these data would be destroyed upon conclusion of this study.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

3.5 Tools for data analysis

IBM SPSS Statistics 24, a statistical package, was employed to analyse demographical data, and correlations among dimensions of ASSMCUS themselves, and correlations between dimensions of ASSMCUS and criterion measurement scales of CAS and SLS. WINSTEPS version 3.71.0.1, a Rasch software package, was used to analyse ASSMCUS data in accordance with the research sub-questions mentioned in Section 1.3 of Chapter 1. Pursuant to Bond and Fox (2007), when Rasch analysis was adopted for constructing a scale, decisions, for instance about whether to include (or exclude) an item, were not taken simply because of sole statistical evidence; theoretical and practical issues had to be taken into consideration in addition to Rasch values.

3.6 Principles of data analysis

Given acculturative stress inflicted on mainland Chinese undergraduate students in Hong Kong, this study explores whether a scale could be constructed to rank them along a continuum of acculturative stress. The following sub-questions, which were mentioned in Section 1.3 of Chapter 1, were addressed:

1. Does the scale exhibit unidimensionality?
2. Do the items fit the Rasch model well?
3. Does the rating scale work well?
4. Do the items exhibit differential item functioning (DIF)?
5. Do the values of person and item reliability and separation indicate adequate psychometric properties for the scale?
6. Do the items exhibit sensible item hierarchies?
7. Does the scale have a good targeting?
8. Does the scale attain convergent validity?

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

If the answers to all above sub-questions are entirely affirmative, ASSCUMUS will be considered an appropriate scale ranking individuals along a continuum of acculturative stress; accordingly, the main research question is positively answered, and the aim of this study is met.

3.6.1 Research sub-question 1: Unidimensionality

Unidimensionality of a scale is determined by means of Rasch principal components analysis (PCA), which reveals significant correlations (if any) within the residuals (i.e., the variance unexplained by the scale). If data are perfectly congruent with Rasch model, the scale will explain all observed variance (i.e., 100%), and no residual is left. In fact, perfect congruence is unrealistic, since some amount of unexplained variance is bound to have. If most of the variance can be explained by the scale and no more significant factors are detected within the residuals, it will be reasonable to admit that the unidimensionality of the scale is attained (Linacre, 1998). According to Linacre (2006), if the unexplained variance in the first PCA contrast is less than 2 eigenvalues, the residuals are random noise, while a large (usually more than 2) eigenvalue implies that there is probably another dimension (i.e., factor) in addition to the Rasch dimension. If eigenvalue is greater than 2, there are two approaches to get around it. The first approach is to examine items in the dimension to see whether some items can be removed to attain unidimensionality, for example, using inter-item correlations to spot comparatively high correlated pair of items to eliminate one of them. The second approach is to examine standardized residual loadings for items in the first PCA contrast. Items with strong positive or negative loadings (e.g., absolute value being .4 or above) are grouped together respectively for theoretical examination to decide whether they can constitute a separate scale. In this study, either one of these approaches or both would be

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

used.

3.6.2 Research sub-question 2: Item fit

Item fit statistics summarize "item-specific deviations of observed and expected response frequencies as global fit statistics" (Rost & von Davier, 1994, p. 171) to determine whether the observed response frequencies conformed to Rasch model. Mean square (MNSQ) fit statistics and z-standardized (ZSTD) fit statistics are commonly used item fit statistics to detect misfitting items in a scale. Rasch literature provides different ranges for item Infit and Outfit MNSQ values concerning good indication of fit. For example, according to Wright, Linacre, Gustafson, & Martin-Lof (1994), the MNSQ for infit and outfit are set to range between .6 and 1.4 for rating scale survey. Such a range serves as a general guideline, but not a hard-and-fast rule, to remove items beyond this range. This study adopted the same range, i.e., between .6 and 1.4, for Infit and Outfit MNSQ values to be good fit between data and Rasch model, since rating scale survey was used in this study. ZSTD value, an approximate unit normally distributed *t* statistic, can be used as a *t*-test for the hypothesis: whether the data perfectly fit the Rasch model (Linacre, 2012, pp. 621-622; Wu & Chang, 2008). The acceptable range of ZSTD value is between -2 and 2. However, sample size has a great impact on ZSTD value. ZSTD value is too insensitive for a sample size of less than 30 (i.e., all item fits), whereas it is too sensitive for a sample size of more than 300 (i.e., all item misfits) (Linacre, 2012, p. 622). Hence, according to Linacre (2012, p. 622), when MNSQ value of an item is acceptable, its ZSTD value can be ignored and the item could be considered fit to the Rasch model.

3.6.3 Research sub-question 3: Rating scale

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

To examine rating scale category functioning, Category Function Analysis in WINSTEPS provides several useful functions to aid the analysis: rating scale category frequencies, average rating scale category measures, unweighted mean square fit statistics, rating scale category thresholds, and a visual assessment of probability curves.

First, to be a meaningful response category, each rating scale category should have a minimum of 10 responses (Linacre, 1999). Low frequencies on a category could be construed as that the category was problematic and should be collapsed with another category (Linacre, 1999).

Second, another useful tool was the observed average rating scale category measures (i.e., the observed average ability for all participants of the sample that endorsed that rating) which, in this study, referred to the average acculturative stress for all participants who selected that rating. These average values were expected to go up when rating scale categories increase. If a category did not follow this pattern, that category was required to collapse with neighbouring categories.

Third, unweighted mean square fit statistics and rating scale category thresholds are two important means to assess category functioning. To comply with Rasch model, outfit mean square statistics need to be less than 2 (Linacre, 1999). Category with value greater than 2 should collapse with neighbouring categories. Rating scale category threshold refers to the difficulty estimated in choosing one response category over the previous category. To differentiate each category with a unique difference in the level of acculturative stress from the other categories, these threshold values are expected to go up when rating scale categories increased. Moreover, since thresholds are not supposed to be very close or very distant from

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

their neighbours, the absolute value of distance between thresholds is a concern. As recommended by Linacre (1999), the incremental value of threshold should fall within 1.4 and 5 logits. On one hand, in case that the distance is less than 1.4, rating scale categories are considered not distinctive and corresponding categories are required to be collapsed. On the other hand, if the distance is greater than 5 logits, a new category is required to be introduced.

Fourth, probability curves generated from WINSTEPS facilitate to examine category functioning visually. The probability curves depict the probability of endorsing each rating scale category. Each properly functioning rating scale category should be able to show a distinct peak. On the contrary, categories which overlap and collapse in the middle cannot provide useful differences in levels of acculturative stress.

The ways to analyse and evaluate described above help identify poor response categories which could be collapsed to improve reliability of the proposed acculturative stress scale in this study. Nonetheless, the first three guidelines are not laws, and only suggest the situation in which the rating scale functions the best (M. Linacre, personal communication, June 24, 2018). If the rating scale is functioning well, i.e., the category probability curves show clear and distinct peaks, there is no need to change the categories at all (M. Linacre, personal communication, June 24, 2018).

3.6.4 Research sub-question 4: Differential item functioning

Rasch analysis facilitates the assessment of DIF, which take places when an item measures a latent trait in a different manner for the two or more compared groups of respondents (Boone, Staver, & Yale, 2014). In other words, DIF takes place when persons of the same ability have items that function differently based on another variable, such as ethnicity or gender.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

When an instrument is free of DIF, its items do not shift in order and spacing as a function of subgroup, i.e., the invariance of the ordering and spacing of items placed (or marked) in a measuring instrument (e.g., a ruler). Assessment of DIF can give useful information about measurement equivalence of an instrument between diverse groups, i.e., generalizability of the instrument. Therefore, DIF analysis could help check the construct equivalence across groups (Wang, 2000).

In this study, assessment of DIF would be performed to strengthen the psychometric evaluation of the proposed scale (i.e., ASSMCUS) by detecting any biased items in ASSMCUS across male and female groups, i.e., gender. Rasch-Welch (logistic regression) *t*-test method would be adopted to report DIF statistics. This method estimates the difference between the Rasch item difficulties for each person group to yield DIF contrasts, keeping everything unchanged. DIF contrast is the effect size of a potential DIF, which helps evaluate how the meaningful the difference is. A significance level at .05 for the Welch probability, and an absolute value of DIF contrast at .64 as cutoff values to determine the existence of DIF items were adopted in this study. If an item had both a Welch probability of less than .05 and an absolute value of DIF contrast greater than .64 (Linacre, 2012, p. 548), then the item was deemed to have DIF as a function of gender. When an item was confirmed to exhibit significant DIF, it would be discarded in this study.

Gender was chosen for DIF analysis in this study, because its effect on acculturative stress was inconsistent in acculturation research. For example, Poyrazli, Arbona, Nora, McPherson, and Pisecco (2002) found that gender differences had an impact on acculturative stress, whereas Sodowsky and Plake (1992); and Poyrazli, Thukral, and Duru (2010) found that gender differences did not impact acculturative stress. Owing to this inconsistency,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

development of measuring scales to measure acculturative stress should consider the grouping variable of gender to ascertain reliability and validity of the measuring scales for gender group of samples.

3.6.5 Research sub-question 5: Reliability and separation

To address this question, statistical values of person and item reliabilities in output tables from WINSTEPS data analysis have to been scrutinized.

Person reliability and item reliability indicated overall stability of the person and item hierarchies. Person hierarchy means arranging sample participants on a line from having least to highest acculturative stress, whereas item hierarchy means arranging items on a line from being most frequently/easiest to least frequently/most difficult to endorse. Person reliability refers to the degree to which the participants of a sample would fall in the same order (from least acculturative stress to most acculturative stress) if a different measure of acculturative stress was administered to them (Wright & Masters, 1982). Item reliability refers to the degree to which the hierarchical order of items (from easiest/most often selected to hardest/least often selected) remains unchanged if participants of another equal size sample attempt this set of items. The criteria for values of person reliability and item reliability were: less than .6 is lowly reliable; .61–.79 is fairly reliable; and .8–1 is highly reliable (Isa & Naim, 2016).

Person reliability index could be associated with Cronbach's alpha coefficient—a measure used to assess the reliability in classical test theory; however, item reliability index was unique to Rasch analysis. These Rasch reliability indices ranged from 0 to 1 (Bond & Fox,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2007). Reliability index closer to a value of 1 implied greater stability of person and item hierarchies.

To ensure having an acceptable and stable reliability, a value of .8 or above was set in this study. When these indices fell below the acceptable value, the scale could be construed as either the set of items lacking full range of acculturative stress or the sample of participants lacking individuals falling within the full range of acculturative stress levels.

Value of person separation indicates the extent to which a scale can separate the persons according to their abilities. In this study, minimum value of person separation was set to 2. If the value fell below 2, it means that the scale did not differentiate person abilities well (Isa & Naim, 2016). Similarly, value of item separation shows the extent to which a scale can separate the items according to their difficulties. In this study, a value of 3 or above was considered good because it means that the scale could divide the items to high, medium, low item difficulties (Isa & Naim, 2016).

Moreover, Linacre (2012) made the following comments on person separation and item separation:

> "Person separation is used to classify people. Low person separation (< 2, person reliability < 0.8) with a relevant person sample implies that the instrument may not be not sensitive enough to distinguish between high and low performers. More items may be needed.
>
> Item separation is used to verify the item hierarchy. Low item separation (< 3 = high, medium, low item difficulties, item reliability < 0.9) implies that the person sample is

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

not large enough to confirm the item difficulty hierarchy (=construct validity) of the instrument." (p. 644).

3.6.6 Research sub-question 6: Item hierarchy

Item hierarchy is created by the order of item difficulty estimates (Conrad, Iris, Ridings, Langley, & Wilber, 2010). For instance, items should form a reasonable ladder with low severity of stressful events/issues at the bottom to high severity of stressful events/issues at the top in this study.

According to Linacre (2012), item hierarchy can be verified by item separation. "Low item separation (< 3 = high, medium, low item difficulties, item reliability < 0.9) implies that the person sample is not large enough to confirm the item difficulty hierarchy (= construct validity) of the instrument" (Linacre, 2012, p. 644).

DIF analysis helps verify item hierarchy of a scale. In this study, DIF as a function of gender involves two groups of respondents (i.e., male and female). If there are no DIF items in the scale, the pattern (order and spacing) of items along the latent trait (i.e., acculturative stress) as a function of difficulty will be the same for a comparison of males and females, that is, a consensus of the hierarchical order of items in the scale will be reached by two groups of respondents.

Construct keymap and person-item map in WINSTEPS are both visual tools depicting the item hierarchy of a scale. In addition, person-item map shows not only hierarchy of items, but also hierarchies of both persons and items side by side. These maps help researcher visually review the strengths and weaknesses of an instrument, item ordering, and item

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

spacing, for example, whether more difficult items are endorsed by persons with higher abilities.

Based on researcher's acculturation knowledge and experiences, researcher needs to examine construct map and person-item map to determine as to whether the item hierarchy of this scale makes sense. In addition, researcher may compare this ordering of items with literature and/or theory/theories (if any) that someone else has proposed.

3.6.7 Research sub-question 7: Targeting (Person-item distribution)

The person-item map was utilized to examine whether the participants' level of acculturative stress (i.e., person ability) matched severity of item (i.e., item difficulty) of the ASSMCUS appropriately. The person-item map provides a visual map, where the severity of the ASSMCUS items relative to the participants' level of acculturative stress are put on the same measurement continuum side by side. Targeting was checked by identifying the difference between average person measure and average item measure that serves as a reference point of zero logit. In this study, if the difference is within 1 logit (Zhou, Almutairi, Alsaid, Warholak, & Cooley, 2017), targeting between the item and person is considered good. The larger the difference between average person measure and average item measure, the more mistargeted the items are to the sample. The floor and ceiling effects were also identified, with percentages above 5% considered significant floor or ceiling effects (Fisher, 2007).

3.6.8 Research sub-question 8: Convergent validity

Convergent validity, in this study, refers to the empirical association between a criterion measurement and a measurement, both of which are theoretically related (Pan, 2008; Pan, Yue, & Chan, 2010). Prior research revealed that acculturative stress was negatively

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

correlated with life satisfaction (Bai, 2016; Pan, Wong, Joubert, & Chan, 2008; Pan, Yue, & Chan, 2010), and positively correlated with negative affect (Pan & Wong, 2011; Pan, Yue, & Chan, 2010). As discussed about their attributes in Section 3.3 of this Chapter, SLS and CAS were used as criterion measurements. If ASSMCUS was significantly correlated with SLS and CAS in the expected directions, ASSMCUS would give evidence that it measures what it claims to be measuring.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Chapter 4: Analyses and Results

4.1 Data cleansing

Questionnaire data were collected on-line between February and March 2018, and automatically stored in a file. Before conducting data analyses, data were downloaded to an MS Excel spreadsheet, which contained the latest data up to 4 April 2018.

Data cleansing was performed to remove corrupt or inaccurate cases (i.e., responses, or records). Five cases of participants doing postgraduate degrees, rather than undergraduate degrees, were removed, i.e., case number / person number (or initial entry number): P85 (MSc in logistics), P155 (Master of Teaching), P234 (Master of Education), P277 (Master of Education), and P280 (MBA). In addition, three cases of participants (i.e., P27, P27, and P170) were dumped due to rendering same response values for all survey items, i.e., picking '1' (Not at all stressful) for survey item question numbers 1 to 172. There were no missing data in this online survey, because all survey items required participants to give responses. In the end, the resulting effective number of cases for data analysis was reduced to 274 from initial 282.

4.2 Demography

Demographic analysis was carried out using MS Excel 2016. The results were presented in Tables 4.1-4.9.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 4.1

Gender

	Number	%
Female	201	73.4
Male	73	26.6

Table 4.2

Age (as at 1 January 2018)

	Number	%
17 or below	1	.4
18	59	21.5
19	62	22.6
20	57	20.8
21	41	15.0
22	32	11.7
23	10	3.6
24	7	2.6
25	0	.0
26	0	.0
27	2	.7
28	2	.7
29	0	.0
30 or above	1	.4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 4.3

From where (province, municipality, or autonomous region)

	Number	%
Hebei Province	4	1.5
Shanxi Province	1	.4
Liaoning Province	18	6.6
Jilin Province	6	2.2
Heilongjiang Province	6	2.2
Jiangsu Province	8	2.9
Zhejiang Province	15	5.5
Anhui Province	6	2.2
Fujian Province	14	5.1
Jiangxi Province	3	1.1
Shandong Province	19	6.9
Henan Province	11	4.0
Hubei Province	8	2.9
Hunan Province	5	1.8
Guangdong Province	70	25.5
Hainan	6	2.2
Sichuan Province	8	2.9
Guizhou Province	11	4.0
Yunnan Province	5	1.8
Shaanxi Province	10	3.6
Gansu province	1	.4
Qinghai Province	0	.0
Beijing City	15	5.5
Tianjin City	3	1.1
Shanghai City	8	2.9
Chongqing City	6	2.2
Guangxi Zhuang Autonomous Region	3	1.1
Inner Mongolia Autonomous Region	1	.4
Tibet Autonomous Region	0	.0
Ningxia Hui Autonomous Region	1	.4
Xinjiang Uygur Autonomous Region	2	.7

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 4.4

Length of stay in Hong Kong

	Number	%
Less than half a year	16	5.8
Half a year or more, and less than a year	104	38.0
One year or more, and less than two years	54	19.7
Two years or more, and less than three years	29	10.6
Three years or more, and less than four years	49	17.9
Four years or more, and less than five years	13	4.7
Five years or more	9	3.3

Table 4.5

Living place

	Number	%
University student dormitory	196	71.5
Self-rented room or apartment from private market	71	25.9
Others	7	2.6

Table 4.6

Religion

	Number	%
No religion	242	88.3
Christianity	14	5.1
Roman Catholicism	0	.0
Buddhism	16	5.8
Taoism	2	.7
Islam	0	.0

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 4.7

Higher learning institution being attended

	Number	%
The University of Hong Kong	16	5.8
The Chinese University of Hong Kong	39	14.2
The Hong Kong University of Science and Technology	15	5.5
The Hong Kong Polytechnic University	21	7.7
City University of Hong Kong	9	3.3
Hong Kong Baptist University	30	10.9
Lingnan University	15	5.5
The Education University of Hong Kong	53	19.3
The Open University of Hong Kong	41	15.0
Hong Kong Shue Yan University	26	9.5
Chu Hai College of Higher Education	8	2.9
HKU SPACE	1	.4

Table 4.8

Sources of tuition fee and living expenses

	Number	%
Family	194	70.8
Relatives or friends	1	.4
Family, and relatives or friends	7	2.6
Family, and the mainland Chinese government	3	1.1
Family, and the university being attended	55	20.1
Family, and others	5	1.8
The university being attended	3	1.1
Others	1	.4
Family, relatives or friends, and the university being attended	1	.4
Family, the mainland Chinese government, and the university being attended	1	.4
The university being attended, and others	1	.4
Family, the university being attended, and others	2	.7

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 4.9

Discipline being pursued

	Number	%
Education	40	14.6
STEM	49	17.9
Language	18	6.6
Social sciences	50	18.2
Business	104	38.0
Arts	8	2.9
Law	2	.7
Others	3	1.1

The above demographic analysis showed that the number of female participants was almost three times of the number of male participants. This high number of female was consistent with the fact that much more female university students are pursuing their studies in local universities in recent decades. The age of participants mainly lied between 18 and 22, making up 91.6% of the sample. Guangdong province including Shenzhen was the participants' leading place of origin, taking up 25.5% which is far more than 2 times of 6.9% in the next popular place, Shangdong Province. More than 57% of the participants stayed in Hong Kong for less than 2 years. University student dormitory was their main lodgings in Hong Kong since more than 70% of the participants were staying there. A large majority (88.3%) of the participants did not have religious beliefs. Participants coming from The Education University of Hong Kong, The Open University of Hong Kong, The Chinese University of Hong Kong, the Hong Kong Baptist University, and Hong Kong Shue Yan University made up almost 69% of the sample. Family was the sole source of financial support for more than 70% of the participants. Business (38%), social sciences (18.2%), STEM (17.9%), and education (14.6%) were four main disciplines being pursued by participants.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Apart from the above demographic data, the questionnaire assessed participants' overall remarks concerning their sojourn in Hong Kong. Table 4.10 below depicts their views.

Table 4.10

Overall remarks

Questions and options	Number	%
Overall, are you satisfied with your studies in Hong Kong?		
Extremely dissatisfied	5	1.8
Dissatisfied	35	12.8
Neither satisfied nor dissatisfied	56	20.4
Satisfied	163	59.5
Extremely satisfied	15	5.5
Overall, are you satisfied with your life in Hong Kong?		
Extremely dissatisfied	6	2.2
Dissatisfied	36	13.1
Neither satisfied nor dissatisfied	58	21.2
Satisfied	156	56.9
Extremely satisfied	18	6.6
What is your plan after graduation?		
Stay in Hong Kong	137	50.0
Return to mainland China	63	23.0
Go to other countries	74	27.0
Do you regret your decision to come to Hong Kong?		
Yes	26	9.5
No	248	90.5

An overwhelming majority, 90%, of the participants did not regret their decision to study in Hong Kong. Nonetheless, only over 60% of the participants were satisfied with both their

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

studies and lives during their sojourns in Hong Kong. Moreover, only half of participants were planning to stay in Hong Kong after graduation.

4.3 Dimensionality of the ASSMCUS

After demographic analysis, WINSTEPS version 3.71.0.1 (Linacre, 2011) was used to test whether the 172-item ASSMCUS can be considered a unidimensional scale. Rasch principal components analysis (i.e., Rasch factor analysis) was conducted to assess ASSMCUS's unidimensionality, the results of which are showed in Table 4.11. The unexplained variance in the first contrast contained an eigenvalue of 17.4 and accounted for 6.1% of the unexplained variance. These values suggest that ASSMCUS contained more than one dimension (also known as factor, domain, construct, or subscale). As such, the dimensions of ASSMCUS were analysed individually.

Table 4.11

Rasch principal components analysis results

	Standardized residual variance (in Eigenvalue units)	% of variance observed	% of variance modeled
Total raw variance in observations	285.7	100.0	100.0
Raw variance explained by measures	113.7	39.8	41.0
Raw variance explained by persons	33.9	11.9	12.2
Raw variance explained by items	79.7	27.9	28.8
Raw unexplained variance (total)	172.0	60.2	59.0
Unexplained variance in 1st contrast	17.4	6.1	
Unexplained variance in 2nd contrast	16.1	5.6	
Unexplained variance in 3rd contrast	9.7	3.4	
Unexplained variance in 4th contrast	6.8	2.4	
Unexplained variance in 5th contrast	6.3	2.2	

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

4.4 Rasch analysis of the 11 initial dimensions of the ASSMCUS

The psychometric properties of the 11 initial dimensions of the ASSMCUS would be examined one by one with the assistance of WINSTEPS software as follows:

4.4.1 English Barrier

The analysis of the initial 17-item English Barrier dimension revealed that the eigenvalue of unexplained variance in the first contrast was 2.8, which suggested that the 17 items did not constitute a unidimensional subscale (see Figure 1 in Appendix 17). Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 17) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 17), the initial English Barrier dimension were split into 3 subdimensions: 3-item group 1 (items Q7 to Q9), 9-item group 2 (items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17), and 5-item group 3 (items Q4, Q5, and Q13 to Q15) for further examination.

In the 3-item group 1 subdimension, the analysis of item statistics showed that all MNSQs of the 3 items fell within .6 and 1.4, although the Infit ZSTDs of item Q7 and Q8 fell slightly beyond the limits of 2 and -2 respectively (Figure 4 in Appendix 17). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, all items in Figure 4 in Appendix 17 could be considered fit to the Rasch model.

As to dimensionality, the eigenvalue of unexplained variance in the first contrast in the principal components analysis of Rasch residuals was 1.7, which was less than the cutoff value of 2; and the raw variance explained by the 3-item group 1 subdimension was 73%, a very high percentage of the explanatory power of the 3-item group 1 subdimension (see

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 5 in Appendix 17). These results suggested that the 3-item group 1 subdimension was unidimensional.

Concerning category functioning, Figures 6 and 7 in Appendix 17 shows the category structure and category probability curves of 3-item group 1 subdimension respectively. As to category structure, all the observed counts were more than 10; the observed averages monotonically increased across 5 categories; all the Outfit MNSQs were less than 2. However, not all structure calibrations advanced by between 1.4 and 5 logits; the increment of structure calibration from categories 2 to 3 was 6.5 logits, more than 5 logits (Linacre, 1999). Nonetheless, all category probability curves in Figure 7 in Appendix 17 exhibited clearly distinct peaks and no peaks overlapped. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided evidence that categories of the 3-item group 1 functioned well.

Regarding gender DIF, item Q8 exhibited gender DIF because of its Welch *t* probability of .0453 (less than .05) and its absolute value of DIF contrast of .7 (greater than .64) (see Figure 8 in Appendix 17). After removing item Q8, there was no more gender DIF (see Figure 9 in Appendix 17).

Notwithstanding the above good psychometrics of the group 1 subdimension, Figure 10 in Appendix 17 shows that the person reliability of the group 1 subdimension was just .5, a moderate reliability, rather than high or close to high reliability of .8. Moreover, its person separation was just 1.01, much less than the cutoff value of 2 (Linacre, 2012, p. 644). Such the low person separation and moderate reliability of the group 1 subdimension rendered it

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ineffective in terms of measurement, and thus the group 1 subdimension was discarded.

In the 9-item group 2 subdimension, the analysis of item fitness showed that all MNSQs were between .6 and 1.4, though not all ZSTDs were within -2 and 2 (see Figure 11 in Appendix 17). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, the 9 items in group 2 subdimension were considered fit to the Rasch model.

The analysis of dimensionality revealed that the eigenvalue of unexplained variance in the first contrast in the principal components analysis of Rasch residuals was 1.8, which was less than the cutoff value of 2; and the raw variance explained by the 9-item group 2 subdimension was 66.2%, a very high percentage of the explanatory power of the 9-item group 2 subdimension (see Figure 12 in Appendix 17). Furthermore, the point-measure correlations of this 9-item group 2 subdimension were all above .5, ranging from .75 to .85 (see Figure 11 in Appendix 17); this demonstrated that the 9 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .75 to .87 (see Figure 13 in Appendix 17), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 9-item data set. All these results corroborated that this 9-item group 2 subdimension was unidimensional.

Analysis of category functioning confirmed that category structure was fit to the Rasch model, as shown in Figure 14 in Appendix 17 that all the observed counts were above 10; all observed averages monotonically increased; all category Outfit MNSQs were below 2; and all structure calibrations advanced by between 1.4 and 5 logits across the 5 categories. In

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

addition, all category probability curves in Figure 15 in Appendix 17 exhibited clearly distinct peaks and no peaks overlapped. All these results provided evidence that categories of the 9-item group 2 functioned well.

As to gender DIF, Figure 16 in Appendix 17 depicts that only item Q2 was a potential gender DIF item due to its low Welch *t* probability of .025, less than the cutoff value of .05. However, its absolute value of DIF contrast was only .53, less than the cutoff value of .64. Hence, there was no gender DIF in this 9-item dimension.

As to separations and reliabilities of this 9-item dimension, Figure 17 in Appendix 17 indicates that person separation and reliability were 3.03 and .9 respectively, whereas item separation and reliability were 8.23 and .99 respectively. Both person and item reliabilities were considered very high, i.e., much above .8. Person separation index value, 3.03, was considered good since it was well above the minimum value of person separation, 2. Item separation index value, 8.23, was considered very good as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 18 in Appendix 17 revealed that there was not satisfactory targeting for the 9-item group 2 subdimension because the mean logit measures of the participants' level of acculturative stress arising from the 9-item group 2 subdimension was found to have a deviation of -1.33 logits from the mean of item severity measures. Some items with low severity should be added between -6 and -7 logits. However, group 2 had neither a floor effect with about 1.5% (= 4/274) of the participants who attained minimum scores (< 5% of the total sample) nor a ceiling effect with about .7% (= 2/274) of the participants who

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

achieved maximum scores (< 5% of the total sample). Furthermore, the item-severity range (as presented by step calibrations of the rating categories in Figure 18 in Appendix 17) generally had sufficient coverage for most of the participants.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.125 for the 9 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.3168 to .263 (see Figure 19 in Appendix 17) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.3168) indicated that those two items only shared about 10% of the variance in their residuals in common (i.e., common variance = correlation^2); 90% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 9-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 20 in Appendix 17). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 9-item subdimension. In addition, the item severity hierarchy map was shown in Figure 21 in Appendix 17.

Taken together, the 9-item group 2 was a valid sub-dimension under English Barrier dimension. While the contents of the 9 items (Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17) were related to using English in Studying and in Interacting with people, group 2 was renamed to English Barrier: Limited English Proficiency.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

In the 5-item group 3 subdimension, the analysis of item fitness showed that all MNSQs were between .6 and 1.4, and all ZSTDs stayed within the range between -2 and 2 (see Figure 22 in Appendix 17). Therefore, all 5 items in group 3 subdimension were fit to the Rasch model.

The analysis of dimensionality revealed that the eigenvalue of unexplained variance in the first contrast in the principal components analysis of Rasch residuals was 1.6, which was less than the cutoff value of 2; and the raw variance explained by the 5-item group 3 subdimension was 75.1%, a very high percentage of the explanatory power of the 5-item group 3 subdimension (see Figure 23 in Appendix 17). Furthermore, the point-measure correlations of this 5-item group 3 subdimension were all above .5, ranging from .84 to .89 (see Figure 22 in Appendix 17); this demonstrated that the 5 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .84 to .9 (see Figure 24 in Appendix 17), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 5-item data set. All these results corroborated that this 5-item group 3 subdimension was unidimensional.

Analysis of category functioning confirmed that category structure of the 5-item group 3 subdimension was fit to the Rasch model, as shown in Figure 25 in Appendix 17 that all the observed counts were above 10; all observed averages monotonically increased; all category Outfit MNSQs were below 2; and all structure calibrations advanced by between 1.4 and 5 logits across the 5 categories. In addition, all category probability curves in Figure 26 in Appendix 17 exhibited distinct peaks and no peaks overlapped. All these results provided evidence that categories of the 5-item group 3 subdimension functioned well.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Concerning gender DIF, Figure 27 in Appendix 17 depicts that no item exhibited DIF as a function of gender in the 5-item group 3 subdimension, since all Welch *t* probabilities were greater than .05, and all absolute values of the DIF contrasts were less than .64.

As to separations and reliabilities of this 5-item group 3 subdimension, Figure 28 in Appendix 17 indicates that person separation and reliability were 2.8 and .89 respectively, whereas item separation and reliability were 6.62 and .98 respectively. Both person and item reliabilities were considered very high, i.e., much above .8. Person separation index value, 2.8, was considered good since it was well above the minimum value of person separation, 2. Item separation index value, 6.62, was considered very good as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 29 in Appendix 17 revealed that there was not satisfactory targeting for the 5-item group 3 subdimension because the mean logit measures of the participants' level of acculturative stress arising from the 5-item group 3 subdimension was found to have a deviation of -1.61 logits from the mean of item severity measures. The group 2 subdimension had a floor effect with about 5.5% (= 15/274) of the participants who attained minimum scores (> 5% of the total sample) but did not have a ceiling effect with about 1.09% (= 3/274) of the participants who achieved maximum scores (< 5% of the total sample). Few items with higher severity might be inserted between 6 and 8 logits to fill the void to address few people with highest level of acculturative stress, and more items with lower severity might be added between -2.5 and -4 logits and between -6.5 and -8 logits in Figure 29 of 17 to fill the gaps, especially for addressing the floor items. Nonetheless, the item-severity range (as presented by step calibrations of the rating categories in Figure 29 in Appendix 17)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

generally had sufficient coverage for most of the participants.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.25 for the 5 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.3786 to -.0838 (see Figure 30 in Appendix 17) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.3768) indicated that those two items only shared about 14% of the variance in their residuals in common (i.e., common variance = correlation^2); 86% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 5-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 31 in Appendix 17). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 5-item subdimension. In addition, the item severity hierarchy map was shown in Figure 32 in Appendix 17.

Taken together, the 5-item group 3 was a valid sub-dimension under English Barrier dimension. While the contents of the 5 items (Q4, Q5, and Q13 to Q15) were related to colloquial English, group 3 was renamed to English Barrier: Limited Colloquial English.

4.4.2 Cantonese Barrier

The analysis of dimensionality of the initial 20-item Cantonese Barrier dimension revealed that the eigenvalue of unexplained variance in the first contrast was 2.7, which suggested that

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

the 20 items did not constitute a unidimensional subscale (see Figure 1 in Appendix 18). Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 18) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 18), the initial Cantonese Barrier dimension were split into 3 subdimensions: 4-item group 1 (items Q27 to Q30), 12-item group 2 (items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37) and 4-item group 3 (items Q22, Q24, Q25, and Q34) for further examination.

In the 4-item group 1 subdimension, the analysis of its dimensionality showed that the eigenvalue of unexplained variance in the first contrast was 2.1, which suggested that the 4 items did not constitute a unidimensional subscale (see Figure 4 in Appendix 18). Derived from residual loadings for items in the first contrast (see Figure 5 in Appendix 18) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 6 in Appendix 18), the 4-item group 1 subdimension were further split into 2 groups: 2-item group 1A (items Q27 and Q30), and 2-item group 1B (items Q28 and Q29).

In the 2-item group 1A, the analysis of item fitness depicted that all MNSQs were within the range between .4 and 1.4; however, all ZSTDs fell into the acceptable bounds of -2 and 2, except item Q30 having an Infit ZSTD value of -2.5 (see Figure 7 in Appendix 18). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, the 2 items in Figure 7 in Appendix 18 could be considered fit to the Rasch model.

The analysis of dimensionality of the 2-item group 1A showed that eigenvalue of unexplained

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

variance in the first contrast was 0, which suggested that the 2 items constituted a unidimensional subscale (see Figure 8 in Appendix 18). In addition, the raw variance explained by the 2-item group 1A was 77.2% (see Figure 8 in Appendix 18), which was a high explanatory power of 2-item group 1A. Therefore, the 2-item group 1A was considered unidimensional.

The analysis of category functioning of the 2-item group 1A indicated that the five categories did not function well. All observed counts were greater than 10; the observed averages monotonically increased; and all Outfit MNSQs were less than 2. However, not all the structure calibrations advanced by between 1.4 and 5 logits; the advance from categories 3 to 4 was just .43 logits, much less than the 1.4 logits (see Figure 9 in Appendix 18). In addition, category probability curves in Figure 10 in Appendix 18 showed that the peak of the probability curve of category 3 was almost covered by probability curves of categories 2 and 4. Therefore, categories 3 and 4 were combined. After doing so, the resulting category structure and probability curves were shown in Figure 11 and 12 in Appendix 18 respectively. This time round, all observed counts were greater than 10; the observed averages monotonically increased; and all Outfit MNSQs were less than 2, and all the structure calibrations advanced by between 1.4 and 5 logits (see Figure 11 in Appendix 18). Also, all probability curves of categories displayed distinct peaks and no peaks overlapped (see Figure 12 in Appendix 18).

Re-analyzing item fitness showed that all MNSQs were within the range between .4 and 1.4, and all ZSTDs fell into the acceptable bounds of -2 and 2 (see Figure 13 in Appendix 18). Hence, the 2 items in group 1A were fit to the Rasch model.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Re-analyzing dimensionality revealed that the eigenvalue of unexplained variance in the first contrast was 0, which suggested that the 2 items constituted a unidimensional subscale (see Figure 14 in Appendix 18). In addition, the raw variance explained by the 2-item group 1A was 70.1% (see Figure 14 in Appendix 18), which was a high explanatory power of 2-item group 1A. Therefore, the 2-item group 1A was unidimensional.

Gender DIF analysis depicted that both Welch *t* probabilities of items Q27 and Q30 were less than .05 and both the absolute values of their DIF contrasts were greater than .64 (see Figure 15 in Appendix 18). Hence, both items Q27 and Q30 were gender DIF items and would be removed to maintain measurement invariance across gender groups in the 2-item group 1A. As a result, group 1A was no longer a valid measuring instrument after removing items Q27 and Q30. Therefore, group 1A was discarded.

Regarding the 2-item group 1B consisting of items Q28 and Q29, analysis of item fitness revealed that all MNSQs were within the range between .4 and 1.4, and all ZSTDs fell into the acceptable bounds of -2 and 2 (see Figure 16 in Appendix 18). Hence, the 2 items in group 1A were fit to the Rasch model.

As to dimensionality of group 1B, the eigenvalue of unexplained variance in the first contrast was 0, which suggested that the 2 items constituted a unidimensional subscale (see Figure 17 in Appendix 18). In addition, the raw variance explained by the 2-item group 1B was 86.8% (see Figure 17 in Appendix 18), which suggested a high explanatory power of 2-item group 1B. These results supported that the 2-item group 1B was unidimensional.

Concerning category functioning of group 1B, Figure 18 in Appendix 18 shows that all

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

observed counts were greater than 10; observed averages monotonically increased across 5 categories, and the all Outfit MNSQs were less than 2. However, all structure calibrations advanced by more than 5 logits, which violated what Linacre (1999) suggested for optimal category functioning. Nonetheless, all the category probability curves exhibited distinct peaks and no peaks overlapped (see Figure 19 in Appendix 18). Taken together, categories in group 1B could be considered functioning well.

As to gender DIF, Figure 20 in Appendix 18 depicts that no item exhibited DIF as function of gender in group 1B. All the Welch *t* probabilities were much above .05, and the absolute values of all the DIF contrasts were much less than .64.

As to separations and reliabilities of this 2-item group 1B, Figure 21 in Appendix 18 indicates that person separation and reliability were 1.91 and .79 respectively, whereas item separation and reliability were 6.65 and .98 respectively. Person reliability of .79 was still considered high, since it was just a bit below .8—the minimum value for high reliability. Item reliability of .98 was considered very high, as it was much above .8 and even close to 1. Person separation index value, 1.91, was considered acceptable since it was just a bit below the minimum value of person separation, 2. Item separation index value, 6.65, was considered very good as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 22 in Appendix 18 is the person-item map (or called Wright map) depicting the item severity (or difficulty in Rasch model's term) hierarchies. Item Q28 ("I feel stressed when I watch Hong Kong's Cantonese TV programs.") with 1.57 logits was higher than item Q29 ("I feel stressed when I listen to Hong Kong's Cantonese radio programs.") with -1.57 logits in

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

terms of severity level. However, the rankings of these two items ran against common sense that it is easier for a person to understand things by watching television (i.e., having pictures and even subtitles) than listening to radio, especially when the language being used on television and radio programs is foreign to a person. As such, this 2-item group 1B did not have construct validity and was discarded, even though it had good and valid psychometric properties as mentioned above.

Regarding 12-item group 2 subdimension consisting of items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, the analysis of item fitness showed that all MNSQs fell within the acceptable bounds of .6 and 1.4, but not all ZSTDs were in the range between -2 and 2 (see Figure 23 in Appendix 18). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, the 12 items in group 2 subdimension, as shown in Figure 23 in Appendix 18, could be considered fit to the Rasch model. However, to enhance the psychometrics, e.g., separations and reliabilities, of group 2 subdimension, underfitting items with values of ZSTDs above 2 were edited to remove the aberrant persons' responses to these items. As indicated in Figure 23 in Appendix 18, there were 3 underfitting items with their ZSTDs above 2, namely, items Q18, Q36, and Q35. As item Q18 topped the list of misfit order, editing started with it first. Four responses to item Q18 made by persons with numbers 87, 183, 254, and 263 (see Figure 24 in Appendix 18) were edited to non-applicable to give Figure 25 in Appendix 18 in which item Q36 came first on the list of misfit order. Four responses to item Q36 made by persons with numbers 88, 101, 153, and 217 (see Figure 26 in Appendix 18) were amended to non-applicable to result in Figure 27 in Appendix 18 in which item Q35 rose to the top of the list of misfit order. Four responses to item Q35 made by persons with numbers 4, 77, 88, and 195 (see Figure 28 in Appendix 18) were edited to non-applicable to give Figure 29 in Appendix 18 in which item Q31 ranked

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

first on the list of misfit order. Two responses to item Q31 made by persons with numbers 51 and 273 (see Figure 30 in Appendix 18) were edited to non-applicable. After doing so, the resulting Figure 31 in Appendix 18 shows that there were no more underfitting items with ZSTDs above 2. Although overfitting items Q20, Q32, and Q33 had ZSTDs below -2, WINSTEPS did not list any more poorly fitting item for further editing (see Figure 32 in Appendix 18) because overfitting items are too predictable. In any event, as long as all the MNSQs were within the acceptable bounds and even all ZSTDs of underfitting items were also within acceptable range, as shown in Figure 31 in Appendix 18, all the 12 items in group 2 subdimension were considered fit to the Rasch model (Linacre, 2012, p. 622).

As to dimensionality, the eigenvalue of unexplained variance in the first contrast in the principal components analysis of Rasch residuals was 1.8, which was less than the cutoff value of 2; and the raw variance explained by the 12-item group 2 subdimension was 74.4%, a very high percentage of its explanatory power (see Figure 33 in Appendix 18). Furthermore, the point-measure correlations were all above .5, ranging from .84 to .91 (see Figure 31 in Appendix 18); this demonstrated that the 12 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .73 to .89 (see Figure 34 in Appendix 18), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 12-item data set. All these results corroborated that this 12-item group 2 subdimension was unidimensional.

Concerning category functioning, Figures 35 and 36 in Appendix 18 shows the category structure and category probability curves of 12-item group 2 subdimension respectively. As to category structure, all the observed counts were more than 10; the observed averages

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

monotonically increased across 5 categories; all the Outfit MNSQs were less than 2; all structure calibrations advanced by between 1.4 and 5 logits. Moreover, all category probability curves in Figure 36 in Appendix 18 exhibited distinct peaks and no peaks overlapped. All these results provided evidence that categories of the 12-item group 2 subdimension functioned well.

As to gender DIF, Figure 37 in Appendix 18 depicts that only item Q35 was a potential gender DIF item because its Welch *t* probability was .0438, less than the cutoff value of .05. Nonetheless, its DIF contrast of .52 was less than .64. Hence, item Q35 could not be regarded as a gender DIF item. Since all the Welch *t* probabilities of the other 11 items were much above .05, and the absolute values of all their DIF contrasts were much less than .64. As such, there was no DIF item as a function of gender in the 12-item group 2 subdimension.

As regards the separations and reliabilities of this 12-item group 2 subdimension, Figure 38 in Appendix 18 indicates that person separation and reliability were 4.06 and .94 respectively, whereas item separation and reliability were 4.74 and .96 respectively. Person reliability of .94 and item reliability of .96 were considered very high, as it was well above .8 and close to 1. Person separation index value, 4.06, was considered high since it was much higher than the minimum value of person separation, 2. Item separation index value, 4.74, was also considered high as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 39 in Appendix 18 revealed that the mean logit measures of the participants' level of acculturative stress arising from the 12-item group 2 subdimension was found to have a deviation of -.42 logit (< .5 logit in absolute value) from the mean of item severity measures,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

suggesting that the two means were quite close. In addition, the 12-item group 2 did not have a ceiling effect with about 3.3% (= 9/274) of the participants who achieved maximum scores (< 5% of the total sample) but had a floor effect with about 11.3% (= 31/274) of the participants who attained minimum scores (> 5% of the total sample). Besides, the 12 items covered the range between about -4.8 and -5.2 logits. Only participants who stayed between 4.5 and 6 logits, and between –5 and -6 logits were out of range. Thus, more severe and easier items might be added in the former and the latter ranges respectively to measure those participants there. Overall, the targeting of these 12 items together with their rating scales on this sample was very good.

Based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.0909 for the 12 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.3312 to .209 (see Figure 40 in Appendix 18) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.3312) indicated that those two items only shared about 11% of the variance in their residuals in common (i.e., common variance = correlation^2); 89% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 12-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 41 in Appendix 18). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 12-item group 2 subdimension. In addition, the item severity hierarchy map was shown in Figure 42 in Appendix 18.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Taken together, the 12-item group 2 was a valid sub-dimension under Cantonese Barrier dimension. While the contents of the 12 items (Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37) were related to using Cantonese in Studying and in Interacting with People, group 2 was renamed to Cantonese Barrier: Limited Cantonese Proficiency.

Regarding 4-item group 3 subdimension consisting of items Q22, Q24, Q25, and Q34, the analysis of item fitness showed that all MNSQs fell within the acceptable bounds of .6 and 1.4, but not all ZSTDs were in the range between -2 and 2 (see Figure 43 in Appendix 18). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, the 4 items in group 3 subdimension, as shown in Figure 43 in Appendix 18, could be considered fit to the Rasch model. However, to enhance the psychometrics, e.g., separations and reliabilities, of group 3 subdimension, underfitting items with values of ZSTDs above 2 were edited to remove the aberrant persons' responses to these items. As indicated in Figure 43 in Appendix 18, there was only 1 underfitting item with its ZSTDs above 2, namely, item Q34. Three responses to item Q34 made by persons with numbers 4, 51, and 141 (see Figure 44 in Appendix 18) were edited to non-applicable. After doing so, the resulting Figure 45 in Appendix 18 shows that there was no underfitting items with ZSTDs above 2. Although the overfitting item Q24 had ZSTDs below -2, WINSTEPS did not list any more poorly fitting item for further editing (see Figure 46 in Appendix 18) because overfitting items are too predictable. In fact, the overfitting item Q24 in Figure 45 in Appendix 18 had improved a bit when compared to that in Figures 43 in Appendix 18. That is, its MNSQs with new value of .69 (from previous .68) moved a bit closer to ideal value of 1, and its ZSTDs became smaller after editing 3 aberrant persons' responses to item Q34. In any event, as long as all the MNSQs were within the acceptable bounds and even all ZSTDs

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

of underfitting items were also within acceptable range, as shown in Figure 45 in Appendix 18, all the 4 items in group 3 subdimension were considered fit to the Rasch model (Linacre, 2012, p. 622).

As to dimensionality, the eigenvalue of unexplained variance in the first contrast in the principal components analysis of Rasch residuals was 1.6, which was less than the cutoff value of 2; and the raw variance explained by the 4-item group 3 subdimension was 82.2%, a very high percentage of its explanatory power (see Figure 47 in Appendix 18). Furthermore, the point-measure correlations were all above .5, ranging from .94 to .97 (see Figure 45 in Appendix 18); this demonstrated that the 4 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .78 to .93 (see Figure 48 in Appendix 18), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 4-item data set. All these results corroborated that this 4-item group 3 subdimension was unidimensional.

Concerning category functioning, Figures 49 and 50 in Appendix 18 shows the category structure and category probability curves of 4-item group 3 subdimension respectively. As to category structure, all the observed counts were more than 10; the observed averages monotonically increased across 5 categories; all the Outfit MNSQs were less than 2. However, not all structure calibrations advanced by between 1.4 and 5 logits; the increment of structure calibration from categories 2 to 3 was 5.36 logits, more than 5 logits (Linacre, 1999). Nonetheless, all category probability curves exhibited distinct peaks and no peaks overlapped. Since Linacre's (1999) guidelines are not laws, they only suggest the best situation in which the rating scale functions. Taken together, these results provided evidence

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

that categories of the 4-item group 3 subdimension functioned well.

As to gender DIF, Figure 51 in Appendix 18 depicts that no item exhibited DIF as function of gender in this 4-item group 3 subdimension. All the Welch *t* probabilities were much above .05, and the absolute values of all the DIF contrasts were much less than .64.

As regards the separations and reliabilities of this 4-item group 3 subdimension, Figure 52 in Appendix 18 indicates that person separation and reliability were 2.93 and .9 respectively, whereas item separation and reliability were 5.45 and .97 respectively. Person reliability of .9 and item reliability of .97 were considered very high, as it was well above .8 and close to 1. Person separation index value, 2.93, was considered fairly high since it was well above the minimum value of person separation, 2. Item separation index value, 5.45, was considered very high as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 51 in Appendix 18 revealed that the mean logit measures of the participants' level of acculturative stress arising from the 4-item group 3 subdimension was found to have a deviation of .37 logit (< .5 logit) from the mean of item severity measures. Nonetheless, the 4-item group 3 had a ceiling effect with about 13.5% (= 37/274) of the participants who achieved maximum scores (> 5% of the total sample) and a floor effect with about 13.9% (= 38/274) of the participants who attained minimum scores (> 5% of the total sample). These results represented an inadequate item to person targeting, particularly for people with the highest or lowest level of acculturative stress were not covered by any items of group 3 subdimension at the top and bottom of Figure 53 in Appendix 18. Much easier and most severe items could be introduced at -8 logits and 7 logits respectively to address this issue of

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

inadequate item to person targeting. Despite this lack of representation, the item-difficulty range (as presented by step calibrations of the rating scale categories in Figure 53 in Appendix 18) had sufficient coverage for the majority of the participants ranging from about -7.8 to 6.5 logits, except for the ceiling and floor participants. Overall, the targeting of these 4 items together with their rating scales on this sample was very good.

Based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.333 for the 4 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.4863 to -.2228 (see Figure 54 in Appendix 18) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.462) indicated that those two items only shared about 21.3% of the variance in their residuals in common (i.e., common variance = correlation^2); 78.7% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 4-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 55 in Appendix 18). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 4-item subdimension. In addition, the item severity hierarchy map was shown in Figure 56 in Appendix 18.

Taken together, the 4-item group 2 was a valid sub-dimension under Cantonese Barrier dimension. While the contents of the 4 items (Q22, Q24, Q25, and Q34) were related to Colloquial Cantonese, group 2 was renamed to Cantonese Barrier: Limited Colloquial

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Cantonese.

4.4.3 Study Stress

The eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 3.3 (see Figure 1 in Appendix 19), which was greater than 2, suggesting that these 13 items of Study Stress dimension did not constitute a unidimensional scale. Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 19) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 19), the initial Study Stress dimension were split into 2 subdimensions: 7-item group 1 (items Q40 to Q44, Q49, and Q50), and 6-item group 2 (items Q38, Q39, and Q45 to Q48) for further examination.

Analysis of item fitness revealed that all MNSQs of 7-item group 1 subdimension were between .6 and 1.4, whereas not all its ZSTDs fell within the acceptable bounds of -2 and 2, (see Figure 4 in Appendix 19). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, all items in Figure 4 in Appendix 19 could be considered fit to the Rasch model. Nonetheless, the only underfitting item Q50 had large values of ZSTD: 4.1 for Infit, and 4 for Outfit. To improve the reliability of the group 1, the persons' responses to the underfitted item Q50 were edited. Six odd or strange responses of person numbers 33, 98, 117, 175, 210, and 224 to item Q50 (see Figure 5 in Appendix 19) were amended to non-applicable, resulting in Figure 6 in Appendix 19 in which all items were still between .6 and 1.4, and the absolute values of all ZSTDs were below 3.

Analysis of dimensionality showed that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.9, which was less than the cutoff value of 2;

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and the raw variance explained by group 1 subdimension was 67.2%, a high percentage of the explanatory power of group 1 subdimension (see Figure 7 in Appendix 19). These results suggested that these 7 items of group 1 subdimension constituted a unidimensional scale.

Category structure of this 7-item group 1 was fit to the Rasch model, as shown in Figure 8 in Appendix 19 that all observed counts were greater than 10; all observed averages monotonically increased; all category Outfit MNSQs were less than 2; and all structure calibrations advanced by between 1.4 and 5 logits across the categories. In addition, all category probability curves in Figure 9 in Appendix 19 exhibited clearly distinct peaks and no peaks overlapped. All these results provided evidence that categories of the 7-item group 1 functioned appropriately in differentiating the acculturative stress level of participants due to group 1 and thus, were not subject to collapse.

Analysis of gender DIF showed that item Q43 exhibited DIF as a function of gender (see Figure 10 in Appendix 19), since the Welch *t* probability of item Q71 was .0021, much less than the cutoff value of .05; and its absolute value of DIF contrast was .74, much above the threshold of .64. After removing item Q43, none of the remaining 6 items exhibited gender DIF (see Figure 11 in Appendix 19).

Re-analysis of item fitness indicated that all MNSQs of 6-item group 1 subdimension were between .6 and 1.4, although not all its ZSTDs fell within the acceptable bounds of -2 and 2, (see Figure 12 in Appendix 19). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, all 6 items in Figure 12 in Appendix 19 could be considered fit to the Rasch model.

Re-analysis of dimensionality depicted that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.8, which was less than the cutoff value of 2;

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and the raw variance explained by group 1 subdimension was 66.3%, a high percentage of the explanatory power of this 6-item group 1 subdimension (see Figure 13 in Appendix 19). The point-measure correlations of this 6-item group 1 subdimension were all above .5, ranging from .8 to .85 (see Figure 12 in Appendix 19); this demonstrated that the 6 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .79 to .84 (see Figure 14 in Appendix 19), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 6-item data set. All these results corroborated that this 6-item group 1 subdimension was unidimensional.

Re-analysis of category functioning confirmed that category structure was fit to the Rasch model, as shown in Figure 15 in Appendix 19 that all observed counts were above 10; all observed averages monotonically increased, all category Outfit MNSQs were below 2; and all structure calibrations advanced by between 1.4 and 5 logits across the categories. In addition, all category probability curves in Figure 16 in Appendix 19 exhibited clearly distinct peaks and no peaks overlapped. All these results provided evidence that categories of the 6-item group 1 functioned well.

Person separation and person reliability of this 6-item group 1 were 2.41 and .85 respectively, whereas item separation and item reliability are 5.36 and .97 respectively (see Figure 17 in Appendix 19). Both person reliability and item reliability of this 6-item group 1 were considered high reliabilities because their values were above .8. Person separation index value, 2.41, was considered acceptable since it was above the minimum value of person separation, 2. Item separation index value, 5.36, was considered very good as it was much higher than the good value of item separation, 3 that can at least divide the items into high,

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

medium, and low item severities (i.e., difficulties).

Figure 18 in Appendix 19 revealed that there was not satisfactory targeting for the 6-item group 1 subdimension because the mean logit measures of the participants' level of acculturative stress arising from the 6-item group 1 subdimension was found to have a deviation of -1.32 logits from the mean of item severity measures. Furthermore, group 1 showed a floor effect with about 5.5% (= 15/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about .7% (= 2/274) of the participants who achieved maximum scores (< 5% of the total sample). Nonetheless, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress level arising from group 1 subdimension and were not addressed by items of any 6-item group 1 at the bottom of Figure 18 in Appendix 19. More items with lower severity should be added between -5 and -6 logits as well as between -2 and -3 logits. Notwithstanding this lack of representation, the item-severity range (as presented by step calibrations of the rating categories in Figure 18 in Appendix 19) generally had sufficient coverage for most of the participants.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.2 for the 6 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.38 to .07 (see Figure 19 in Appendix 19) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.38) indicated that those two items only shared about 14.4% of the variance in their residuals in common (i.e., common variance = correlation^2); 85.6% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Concerning the issue of item hierarchy, the construct keymap of this 6-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 20 in Appendix 19). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 6-item subdimension. In addition, the item severity hierarchy map was shown in Figure 21 in Appendix 19.

Taken together, the 6-item group 1 was a valid sub-dimension under Study Stress dimension. While the contents of the 6 items (Q40 to Q42, Q44, Q49, and Q50) were fundamentally related to studying hard to attain a good academic performance, group 1 was renamed to Study Stress: Heavy Course Load.

Regarding 6-item group 2 subdimension, the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 2.1 (see Figure 22 in Appendix 19), which was greater than 2, suggesting that these 6 items of group 2 subdimension did not constitute a unidimensional scale. Derived from residual loadings for items in the first contrast (see Figure 23 in Appendix 19) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 24 in Appendix 19), the 6-item group 2 subdimension were split into 2 further subdimensions: 3-item group 2A (items Q39, Q45, and Q46), and 3-item group 2B (items Q38, Q47, and Q48) for further examination.

Concerning 3-item group 2A, analysis of item fitness revealed that there was one underfitting item, Q39, which had its Outfit MNSQ greater than 1.4, and both its ZSTDs greater than 2 (see Figure 25 in Appendix 19). Owing to small number of items, i.e., 3 items, editing the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

persons' responses to item Q39, rather than removing item Q39, was adopted. Four odd or strange responses of person numbers 40, 88, 153 and 231 to item Q39 (see Figure 26 in Appendix 19) were amended to non-applicable, resulting in Figure 27 in Appendix 19 in which item Q39 was still an item misfit with its Outfit MNSQ greater than 1.4 and both its ZSTDs greater than 2. Therefore, removal of item Q39 was taken as a last resort. After doing so, the item statistics showed that the remaining 2 items fell within the acceptable bounds of MNSQ (i.e., between .6 and 1.4) and of ZSTD (i.e. between -2 and 2). Having said that, its values of both person separation and person reliability being zero (see Figure 29 in Appendix 19) rendered 2-item group 2A to be an unreliable scale. As a result, group 2A was discarded.

As to the remaining 3-item group 2B, analysis of item fitness showed that there was an underfitting item, Q38. Both its MNSQs were below 1.4, but its ZSTDs were greater than 2 (see Figure 28 in Appendix 19). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, the 3 items in Figure 28 in Appendix 19 could be considered fit to the Rasch model. Nonetheless, Q38 had large values of ZSTD: 2.9 for Infit, and 3.3 for Outfit. To improve the reliability of the group 2B, the persons' responses to the underfitted item Q38 were edited. Nine aberrant responses of person numbers 16, 31, 81, 113, 127, 226, 229, 243, and 266 to item Q38 (see Figure 29 in Appendix 19) were amended to non-applicable, resulting in Figure 30 in Appendix 19 in which all items were still between .6 and 1.4, and the absolute values of all corresponding ZSTDs were below 2. Hence, all the 3 items in group 2b were fit to the Rasch model.

The analysis of dimensionality in Figure 31 in Appendix 19 showed that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals in the 3-item group 2B was 1.5, less than the cutoff value of 2. In addition, the raw variance explained by this 3-item

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

group 2B was 72.8%, a very high percentage of the explanatory power of group 2B (see Figure 31 in Appendix 19). The point-measure correlations were all above .5, ranging from .8 to .89 (see Figure 30 in Appendix 19); this demonstrated that the 3 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .8 to .9 (see Figure 32 in Appendix 19), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 3-item data set. All these results corroborated that 3-item group 2B was unidimensional.

According to Linacre's (1999) guidelines on the effectiveness of rating scale functioning, the category structure of the 3-item group 2B was deemed fit to the Rasch model because all observed counts were greater than 10; all observed averages monotonically increased; all category Outfit MNSQs were less than 2; and all structure calibrations advanced by between 1.4 and 5 logits across the 5 categories (see Figure 33 in Appendix 19). In addition, all category probability curves in Figure 34 in Appendix 19 exhibited distinct peaks and no peaks overlapped. All results provided evidence that categories of the 3-item group 2B functioned well.

The analysis of gender DIF showed that none of the 3 items exhibited DIF as a function of gender (see Figure 35 in Appendix 19). The Welch *t* probabilities of all 3 items were much greater than .05; and the absolute values of all DIF contrasts were much less than .64. Hence, measurement invariance was maintained across gender groups in this 3-item group 2B.

Person separation and person reliability of this 3-item group 2B were 1.72 and .75 respectively, whereas item separation and item reliability are 8.91 and .99 respectively (see Figure 36 in Appendix 19). Person reliability of .75 was considered moderately reliable as it was below the threshold of high reliability of .8 or above. Item reliability of .99 was

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

considered very high reliable because it was much above .8 and very close to 1. Person separation index value, 1.72, was considered poor since it was below the minimum value of person separation, 2. Item separation index value, 8.91, was considered very good as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 37 in Appendix 19 revealed that there was not satisfactory targeting for the 3-item group 2B because the mean logit measures of the participants' level of acculturative stress arising from the 3-item group 2B was found to have a deviation of -2.09 logits from the mean of item severity measures. Furthermore, group 1 showed a floor effect with about 12% (= 33/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about .7% (= 2/274) of the participants who achieved maximum scores (< 5% of the total sample). Nonetheless, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress level arising from the 3-item group 2B and were not addressed by items of any group 2B at the bottom of Figure 37 in Appendix 19. On one hand, items with lower severity should be added between -2 and -4 logits and near the bottom of Figure 37 in Appendix 19. On the other hand, there was a big gap between items Q38 and Q48. Some items could be introduced to fill this gap. Notwithstanding this lack of representation, the item-severity range (as presented by step calibrations of the rating categories in Figure 37 in Appendix 19) generally had sufficient coverage for most of the participants.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.5 for the 3 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.53 to -.48 (see Figure 38 in Appendix 19) and were not too much deviated from

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

the ideal value. Moreover, the highest correlation (-.53) indicated that those two items only shared about 28.1% of the variance in their residuals in common (i.e., common variance = correlation^2); 71.9% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 3-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 39 in Appendix 19). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 3-item subdimension. In addition, the item severity hierarchy map was shown in Figure 40 in Appendix 19.

Taken together, the 3-item group 2B was a valid measuring instrument. Since the contents of the 3 items (Q38, Q47, and Q48) were related to ways of teaching and learning, group 2B was renamed to Study Stress: Student-Centred Learning Approach.

4.4.4 Cultural Difference

The eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 3.3 (see Figure 1 in Appendix 20), which was greater than 2, suggesting that these 27 items of Cultural Difference dimension did not constitute a unidimensional scale. Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 20) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 20), the initial Cultural Difference dimension were split into 3 subdimensions: 6-item group 1 (items Q72 to Q77), 12-item group 2 (items Q59, and Q61 to Q71), and 9-item group 3 (items Q51 to 58, and Q60) for further examination.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Analysis of item fitness revealed that all MNSQs of 6-item group 1 subdimension were between .6 and 1.4 and all its ZSTDs fell within the acceptable bounds of -2 and 2, except item Q76 which had both Infit ZSTD and Outfit ZSTD less than -2 (see Figure 4 in Appendix 20). Nonetheless, item Q76 ("I feel frustrated when others do not understand my cultural values.") was kept because its content was relevant to acculturative stress due to group 1; the number of items in group 1 subdimension was 6, a small number; item Q76 was an overfit, rather than underfit, item; and the deviations of its ZSTDs from cutoff value, -2, were very small, just -.4 and -.7. Hence, all the 6 items in group 1 subdimension were considered fit to the Rasch model.

The analysis of dimensionality of the 6-item group 1 subdimension shows that eigenvalue of the first contrast in the principal components analysis was 1.7, less than the cutoff value of 2, and the raw variance explained by this 6-item group 1 subdimension was 69.4%, a very high percentage of the explanatory power of group 1 subdimension (see Figure 5 in Appendix 20). The point-measure correlations of the 6-item group 1 subdimension were all above .5, ranging from .81 to .88 (see Figure 4 in Appendix 20); this demonstrated that the 6 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .81 to .89 (see Figure 6 in Appendix 20), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 6-item data set. All these results corroborated that 6-item group 1 was a unidimensional subdimension.

Category structure of 6-item group 1 was fit to the Rasch model as shown in Figure 7 in Appendix 20 that all observed counts were above 10; all observed average monotonically

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

increased; and all category Outfit MNSQs were less than 2. Not all structure calibrations advanced by between 1.4 and 5 logits across the categories; the increment of structure calibration from categories 4 to 5 was just 1.29 logits, less than the cutoff value of 1.4 logits. On the other hand, all category probability curves in Figure 8 in Appendix 20 exhibited distinct peaks and no peaks overlapped, though the peak of probability curve of category 4 was neither sharp nor high. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided evidence that categories of the 6-item group 1 functioned appropriately in differentiating the acculturative stress level of participants due to group 1 and thus, were not subject to collapse.

The analysis of gender DIF in this 6-item group 1 subdimension depicted that the Welch *t* probabilities of all 6 items were much greater than .05; and the absolute values of all DIF contrasts were much less than .64 (see Figure 9 in Appendix 20). Hence, measurement invariance was maintained across gender groups in this 6-item group 1 subdimension.

Person separation and person reliability of this 6-item group 1 were 2.41 and .85 respectively, whereas item separation and item reliability are 4.18 and .95 respectively (see Figure 10 in Appendix 20). Both person reliability and item reliability of this 6-item group 1 were considered high reliabilities because their values were above .8. Person separation index value, 2.41, was considered acceptable since it was above the minimum value of person separation, 2. Item separation index value, 4.18, was considered very good as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 12 in Appendix 20 revealed that there was not satisfactory targeting for the 6-item group 1 subdimension because the mean logit measures of the participants' level of acculturative stress arising from the 6-item group 1 subdimension was found to have a deviation of -1.51 logits from the mean of item severity measures. Furthermore, group 1 showed a floor effect with about 13.9% (= 38/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about 1.5% (= 4/274) of the participants who achieved maximum scores (< 5% of the total sample). Nonetheless, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress level arising from group 1 subdimension and were not addressed by items of any 6-item group 1 at the bottom of Figure 12 in Appendix 20. However, there was quite wide coverage of the latent variable (i.e., acculturative stress arising from the 6-item group 1 subdimension) by the item thresholds from about -5 to 4.2 logits, as shown in Figure 12 in Appendix 21. On one hand, more items with lower severity should be added between -5 and -6 logits to address the floor effect. On the other hand, a few items with higher severity could be introduced between 4.5 to 5 logits to address some participants with higher acculturative stress level arising from group 1 subdimension.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.2 for the 6 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.38 to .03 (see Figure 13 in Appendix 20) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.39) indicated that those two items only shared about 14.4% of the variance in their residuals in common (i.e., common variance = correlation^2); 85.6% of each of their residual variances differ. Hence, there was no

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 6-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 14 in Appendix 20). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 6-item subdimension. In addition, the item severity hierarchy map was shown in Figure 11 in Appendix 20.

Taken together, the 6-item group 1 was a valid sub-dimension under Cultural Difference dimension. As the content of the 6 items (Q72 to Q77) was related to misunderstanding of each other's cultures, group 1 was renamed to Cultural Difference: Mutual Cultural Misunderstanding.

Regarding 12-item group 2 subdimension, Figure 15 in Appendix 20 shows that there were 4 underfitting items (i.e., Q66, Q61, Q64 and Q63), and 5 overfitting items (i.e., Q69, Q70, Q62, Q68, and Q71). According to misfit order in Figure 15 in Appendix 20, the most misfitting item Q66 was removed first to result in Figure 16 in Appendix 20. Item Q61, as the most misfitting one among the remaining 11 items, was taken out to make item Q64 become the next most misfitting item as shown in Figure 17 in Appendix 20. Discarding item Q64 brought out Figure 18 in Appendix 20 in which item Q63 was at the top of the misfit order list. After eliminating item Q63—the most misfitting item out of the 9 remaining items, Figure 19 in Appendix 20 shows the item statistics of the 8 subsequent items in misfit order. All the items fall within the acceptable bounds of value of MNSQs, i.e., between .6 and 1.4. According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ZSTD can be ignored. Therefore, all items in Figure 19 in Appendix 20 could be considered fit to the Rasch model. Nonetheless, in order to improve the reliability of the group 2, the persons' responses to underfitted items with values of ZSTDs to be 2 or above (i.e., items Q67, Q59, and Q65) were edited successively. As item Q67 was at the top of misfit order list in Figure 19 in Appendix 20, it was chosen to be edited first for its persons' responses. Five odd or strange responses of person numbers 59, 175, 183, 198, and 204 to item Q67 (see Figure 20 in Appendix 20) were changed to non-applicable. After doing so, item Q59 came top of misfit order in Figure 21 in Appendix 20. Four odd responses of person numbers 122, 163, 219, and 262 to item Q59 (see Figure 22 in Appendix 20) were amended to non-applicable, resulting in Figure 23 in Appendix 20 in which item Q65 was ranked first in misfit order list. Seven odd responses of person numbers 60, 80, 82, 107, 113, 195, and 251 to item Q65 (see Figure 24 in Appendix 20) were corrected to non-applicable, giving Figure 25 in Appendix 20. Item Q59 resurfaced to be the top of misfit order list in Figure 23 in Appendix 20. However, the minute deviations of Infit and Outfit ZSTDs of item Q59 were .1 and 0, and the MNSQs of item Q59 were within the limits of cutoff value (i.e., between .6 and 1.4. Therefore, all the remaining 8 items in group 2 were considered fit to the Rasch model.

Analysis of dimensionality in Figure 26 in Appendix 20 shows that eigenvalue of the first contrast in the principal components analysis of Rasch residuals in this 8-item group 2 was 1.9, less than the cutoff value of 2. In addition, the raw variance explained by this 8-item group 2 was 56.8%, a good percentage of the explanatory power of group 2. Taken together, these results provided evidence that this 8-item group 2 was a unidimensional subdimension. Meeting some Linacre's (1999) guidelines, category structure of 8-item group 2 was shown in Figure 27 in Appendix 20 to have observed counts greater than 10, observed average

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

monotonically increasing, and category Outfit MNSQs less than 2. However, not all structure calibrations advanced by between 1.4 and 5 logits across the categories; the increments of structure calibrations from categories 3 to 4 and from categories 4 to 5 were just 1.19 and 1.11 logits respectively, less than the cutoff value of 1.4 logits. Nonetheless, all category probability curves in Figure 28 in Appendix 20 exhibited distinct peaks and no peaks were overlapped, even though the peaks of probability curve of categories 3 and 4 were neither sharp nor high. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided evidence that categories of the 8-item group 2 functioned appropriately in differentiating the acculturative stress level of participants due to group 2 and thus, were not subject to collapse.

Analysis of gender DIF showed that item Q71 exhibited DIF as a function of gender (see Figure 29 in Appendix 20), since the Welch *t* probability of item Q71 was .0185, much less than the cutoff value of .05; and its absolute value of DIF contrast was .66, above the threshold of .64. After removing item Q71, item Q65 emerged as a DIF item with the Welch *t* probability being .0421 and the absolute value of DIF contrast being .66 (see Figure 30 in Appendix 20). Thus, item Q65 was also eliminated from group 2, bringing about a 6-item subdimension (see Figure 31 in Appendix 20) in which the Welch *t* probabilities of all 6 items were much greater than .05 and the respective absolute values of DIF contrasts were much less than .64. Hence, the 6-item group 2 subdimension was free of gender DIF.

Re-analysis of item fitness showed that all 6 items fell within the acceptable bounds of MNSQs (i.e., below 1.4 and above .6) and ZSTDs (i.e., below 2 and above -2) (see Figure 32 in Appendix 20). All MNSQs were very near the value of 1, the expected value of MNSQ statistics when there was perfect fit between data and model (Linacre, 2012), indicating very

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

good fit of data to the Rasch model.

Re-analysis of dimensionality revealed that eigenvalue of the first contrast in the principal components analysis was 1.7, less than the cutoff value of 2; moreover, the raw variance explained by this 6-item group 2 was 56.7%, a good percentage of the explanatory power of group 2 (see Figure 33 in Appendix 20). The point-measure correlations of the 6-item group 2 were all above .5, ranging from .67 to .77 (see Figure 32 in Appendix 20); this demonstrated that the 6 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .73 to .78 (see Figure 34 in Appendix 20), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 6-item data set. All these results corroborated that this 6-item group 2 was underpinned by single dimension.

Re-analysis of category functioning depicted that all the observed counts were above 10; all observed averages monotonically increased; and all category Outfit MNSQs were less than 2 (see Figure 35 in Appendix 20). However, not all structure calibrations advanced by between 1.4 and 5 logits across the categories; the increments of structure calibrations from categories 3 to 4 and from categories 4 to 5 were just 1.21 and 1.04 logits respectively, less than the cutoff value of 1.4 logits (see in Figure 35 in Appendix 20). Nonetheless, all category probability curves in Figure 36 in Appendix 20 exhibited distinct peaks and no peaks were overlapped, even though the peaks of probability curve of categories 3 and 4 were neither sharp nor high. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided evidence that categories of the 6-item group 2 functioned appropriately in differentiating the acculturative stress level of participants due to group 2 and thus, were not subject to collapse.

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Person separation and person reliability of the 6-item group 2 were 1.78 and .76 respectively, whereas item separation and item reliability are 6.7 and .98 respectively (see Figure 37 in Appendix 20). Person reliability of .76 was marginally below the cut-off value for high reliability of .8 or above, whereas item reliability of .98 were considered very high reliability, i.e., above .8 and close to 1. Person separation index value, 1.78, was considered poor since it was below the minimum value of person separation, 2. Item separation index value, 6.7, was considered very good as it was very much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 38 in Appendix 20 revealed that there was not satisfactory targeting for the 6-item group 2 subdimension because the mean logit measures of the participants' level of acculturative stress arising from the 6-item group 2 subdimension was found to have a deviation of -1.73 logits from the mean of item severity measures. Group 2 also had a floor effect with about 12.4% (= 34/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about .36% (= 1/274) of the participants who achieved maximum scores (< 5% of the total sample). These results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress level arising from group 2 subdimension and were not addressed by items of any 6-item group 2 at the bottom of Figure 38 in Appendix 20. On one hand, more items with lower severity should be added between -3.8 and -5 logits. On the other hand, a few items with severity between Q69 and Q68 as well as between Q68 and Q62 could be introduced to address the gaps between these items. Despite this unsatisfactory targeting, the item-severity range (as presented by step calibrations of the rating categories in Figure 38 in Appendix 20) generally had sufficient coverage for the majority of the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

participants.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.2 for the 6 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.36 to .15 (see Figure 38 in Appendix 20) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.36) indicated that those two items only shared about 13% of the variance in their residuals in common (i.e., common variance = correlation^2); 87% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 6-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 39 in Appendix 20). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 6-item subdimension. In addition, the item severity hierarchy map was shown in Figure 40 in Appendix 20.

Taken together, the 6-item group 2 was a valid sub-dimension under Cultural Difference dimension. As the content of the 6 items (Q59, Q62, Q67, Q68, Q69, and Q70) was related to local culture and value, group 2 was renamed to Cultural Difference: Identifying with Hong Kong's Culture and Values.

Concerning the 9-item group 3 subdimension, Figure 41 in Appendix 20 shows that there were 2 underfitting items (i.e., Q57 and Q58), and 3 overfitting items (i.e., Q51, Q55, and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Q54). According to misfit order in Figure 41 in Appendix 20, the most misfitting item Q57 was removed first to result in Figure 42 in Appendix 20. Item Q58, as the most misfitting one among the remaining 8 items in Figure 42 in Appendix 20, was taken out to bring about Figure 43 in Appendix 20, which shows that all 7 items fell within the acceptable bounds of value of MNSQs, i.e., between .6 and 1.4. According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, all 7 items in Figure 43 in Appendix 20 could be considered fit to the Rasch model.

Analysis of dimensionality revealed that eigenvalue of the first contrast in the principal components analysis was 1.7, less than the cutoff value of 2; moreover, the raw variance explained by this 7-item group 3 was 67.1%, a good percentage of the explanatory power of group 3 (see Figure 44 in Appendix 20). The point-measure correlations of the 7-item group 3 were all above .5, ranging from .77 to .85 (see Figure 43 in Appendix 20); this demonstrated that the 7 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .79 to .88 (see Figure 45 in Appendix 20), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 7-item data set. All these results corroborated that this 7-item group 3 was underpinned by single dimension.

Analysis of category functioning depicted that all the observed counts were above 10; all observed averages monotonically increased; and all category Outfit MNSQs were less than 2 (see Figure 46 in Appendix 20). However, not all structure calibrations advanced by between 1.4 and 5 logits across the categories; the increment of structure calibration from categories 4 to 5 was just .98 logit, less than the cutoff value of 1.4 logits (see in Figure 46 in Appendix 20). Nonetheless, all category probability curves in Figure 47 in Appendix 20 exhibited

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

distinct peaks and no peaks were overlapped, even though the peak of probability curve of category 4 was neither sharp nor high. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided evidence that categories of the 7-item group 3 functioned appropriately in differentiating the acculturative stress level of participants due to group 3 and thus, were not subject to collapse.

Analysis of gender DIF showed that item Q60 exhibited DIF as a function of gender (see Figure 48 in Appendix 20), since the Welch *t* probability of item Q60 was .0084, much less than the cutoff value of .05; and its absolute value of DIF contrast was .75, above the threshold of .64. After removing item Q60, item Q53 emerged as a DIF item with the Welch *t* probability being .0158 and the absolute value of DIF contrast being .74 (see Figure 49 in Appendix 20). Thus, item Q53 was also eliminated from group 3, bringing about a 5-item subdimension (see Figure 50 in Appendix 20) in which the Welch *t* probabilities of all 5 items were much greater than .05 and the respective absolute values of DIF contrasts were less than .64. Hence, the 5-item group 3 subdimension was free of gender DIF.

Re-analysis of item fitness showed that all 5 items fell within the acceptable bounds of MNSQs (i.e., below 1.4 and above .6) and ZSTDs (i.e., below 2 and above -2) (see Figure 51 in Appendix 20). All MNSQs were near the value of 1, the expected value of MNSQ statistics when there was perfect fit between data and model (Linacre, 2012), indicating good fit of data to the Rasch model.

Re-analysis of dimensionality depicted that eigenvalue of the first contrast in the principal components analysis was 1.7, less than the cutoff value of 2; moreover, the raw variance

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

explained by this 5-item group 3 was 70.3%, a very good percentage of the explanatory power of group 3 (see Figure 52 in Appendix 20). The point-measure correlations of the 5-item group 3 were all above .5, ranging from .85 to .87 (see Figure 51 in Appendix 20); this demonstrated that the 5 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .85 to .88 (see Figure 53 in Appendix 20), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 5-item data set. All these results corroborated that this 5-item group 3 was underpinned by single dimension.

Re-analysis of category functioning depicted that all the observed counts were above 10; all observed averages monotonically increased; and all category Outfit MNSQs were less than 2 (see Figure 54 in Appendix 20). However, not all structure calibrations advanced by between 1.4 and 5 logits across the categories; the increment of structure calibration from categories 4 to 5 was just 1.26 logits, less than the cutoff value of 1.4 logits (see in Figure 54 in Appendix 20). Nonetheless, all category probability curves in Figure 55 in Appendix 20 exhibited distinct peaks and no peaks were overlapped, even though the peak of probability curve of category 4 was neither sharp nor high. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided evidence that categories of the 5-item group 3 functioned appropriately in differentiating the acculturative stress level of participants due to group 3 and thus, were not subject to collapse.

Person separation and person reliability of the 5-item group 3 were 2.27 and .84 respectively, whereas item separation and item reliability are .59 and .26 respectively (see Figure 56 in Appendix 20). Person reliability of .84 was above the cut-off value for high reliability of .8,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

whereas item reliability of .26 were considered very low reliability, i.e., much below .8. Person separation index value, 2.27, was considered acceptable since it was a bit above the minimum value of person separation, 2. Item separation index value, .59, was considered very poor as it was far away from the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties). Owing to its very low values of item separation and reliability, this 5-item group 3 subdimension could not be accepted as a reasonably good scale; thus it was discarded.

4.4.5 Social Interaction

The eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 3.2 (see Figure 1 in Appendix 21), which was greater than 2, suggesting that these 24 items of Social Interaction dimension did not constitute a unidimensional scale. Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 21) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 21), the Discrimination dimension were split into 3 groups: 6-item group 1 (items Q81 to Q84, and items Q89 to Q90), 11-item group 2 (items Q78 to Q80, items Q85 to Q88, and items Q92, Q94, Q96, and Q98), and 7-item group 3 (items Q91, Q93, Q95, Q97, and items Q99 to Q101) for further examination.

Analysis of item fitness revealed that all MNSQs of 6-item group 1 were between .6 and 1.4 and all its ZSTDs fell within the acceptable bounds of -2 and 2, except item Q84 which had both Infit ZSTD and Outfit ZSTD less than -2 (see Figure 4 in Appendix 21). Nonetheless, item Q84 ("In Hong Kong, it is hard to find a close confidant I can confide in.") was kept because its content was relevant to acculturative stress due to group 1; the number of items in group 1 was 6, a small number; item Q84 was an overfit, rather than underfit, item; and the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

deviations of its ZSTDs from cutoff value, -2, were very minute, just -.1 and .4. Hence, all the 6 items in group 1 were considered fit to the Rasch model.

Figure 5 in Appendix 21 shows that eigenvalue of the first contrast in the principal components analysis of Rasch residuals in 6-item group 1 was 2 (just a borderline case of reaching the cutoff value of 2), and the raw variance explained by this 6-item group 1 was 69%, a high percentage of the explanatory power of group 1. Taken together, these results provided evidence that 6-item group 1 was a unidimensional subdimension.

Category structure of 6-item group 1 was shown fit to the Rasch model in Figure 6 in Appendix 21: observed counts greater than 10, observed average monotonically increasing, category Outfit MNSQs less than 2. Not all structure calibrations advanced by between 1.4 and 5 logits across the categories; the increment of structure calibration from categories 4 to 5 was just 1.29 logits, less than the cutoff value of 1.4 logits. On the other hand, all category probability curves in Figure 7 in Appendix 21 exhibited distinct peaks and no peaks were overlapped, though the peak of probability curve of category 4 was not sharp. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided evidence that categories of the 6-item group 1 functioned appropriately in differentiating the acculturative stress level of participants due to group 1 and thus, were not subject to collapse.

Analysis of gender DIF revealed that only one item of the 6-item group 1, item Q82, potentially exhibited DIF as a function of gender (see Figure 8 in Appendix 21). The Welch *t* probability of item Q82 was .0356, less than the cutoff value of .05; and its absolute value of DIF contrast was .64, just a border-line case of reaching the threshold of .64. Removing

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

item Q82 resulted in a DIF-free 5-item group 1 as shown in Figure 9 in Appendix 21. The Welch *t* probabilities were all much greater than .05; and the absolute values of all DIF contrasts were much less than .64. Hence, measurement invariance was maintained across gender groups in this 5-item group 1.

Re-analysis of item fitness was performed after item Q82 was deleted. Figure 10 in Appendix 21 shows that there were two item misfits—underfitting item Q81 and overfitting item Q84. Their problems lay in their ZSTDs. Underfitting item Q81 had both ZSTDs greater than 2, and overfitting item Q84 had both ZSTDs less than -2. In terms of misfit order, an underfitting item ranks higher than an overfitting item. Therefore, item Q81 was picked for further action. Since the number of items were not many in group 1, just 5 items, editing the persons' responses to item Q81 was preferable to removing it. After changing 4 odd or strange persons' responses to item Q81 to non-applicable, i.e., person numbers 93, 101, 216, and 225 (see Figure 11 in Appendix 21), there was still one item misfit in the 5-item group 1 subdimension (see Figure 12 in Appendix 21), i.e., item Q84 with ZSTDs less than -2. Nonetheless, item Q81 was retained without any further modification with respect to the persons' responses, because first, the deviations from cutoff value ZSTD of -2 were not great, just about .2 for Infit ZSTD and .6 for Outfit ZSTD; second, the number of items in group 1 was small, just 5 items, and other items did not have the same level of Rasch measure value as that of item Q84. Thus, removing it would be likely to undermine test precision; third, the content of item Q84 ("In Hong Kong, it is hard to find a close confidant I can confide in.") was relevant to acculturative stress due to group 1 subdimension; fourth, the Table 11.1 generated from "11. ITEM: responses in WINSTEPS" displayed a message of "no poorly fitting item" (see Figure 13 in Appendix 21) for editing persons' responses. Hence the revised 5-item group 1 subdimension was considered fit to Rasch model.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Re-analysis of dimensionality of the 5-item group 1 subdimension, after removal of item Q82 and editing 4 persons' responses to item Q81, showed that eigenvalue of the first contrast in the principal components analysis was 1.6, less than the cutoff value of 2, and the raw variance explained by this 5-item group 1 was 71.6%, a very high percentage of the explanatory power of group 1 (see Figure 11 in Appendix 21). The point-measure correlations of the 5-item group 1 were all above .5, ranging from .85 to .9 (see Figure 10 in Appendix 21); this demonstrated that the 5 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .86 to .9 (see Figure 12 in Appendix 21), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 5-item data set. All these results corroborated that 5-item group 1 was a unidimensional subdimension.

Re-analysis of category structure of the 5-item group 1 dimension, after removal of item Q82 and editing 4 persons' responses to item Q81, revealed that all the observed counts were greater than zero in 5 categories; all the observed averages increased monotonically across 5 categories; and all the Outfit MNSQs were all less than 2 in 5 categories (see Figure 13 in Appendix 21). Nonetheless, not all structure calibrations advanced by between 1.4 and 5 logits across the 5 categories; the increment of structure calibration from categories 4 to 5 was just 1.21 logits, less than the cutoff value of 1.4 logits. On the other hand, all category probability curves in Figure 14 in Appendix 21 exhibited distinct peaks and no peaks were overlapped, though the peak of probability curve of category 4 was not sharp and the lowest among all peaks. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

evidence that categories of the 5-item group 1 functioned appropriately in differentiating the acculturative stress level of participants due to group 1 and thus, were not subject to collapse.

Re-analysis of gender DIF, after removal of item Q82 and editing 4 persons' responses to item Q81, depicted that the Welch *t* probabilities of all 5 items were all much greater than .05; and the absolute values of all DIF contrasts were much less than .64 (see Figure 15 in Appendix 21). Hence, measurement invariance was maintained across gender groups in this 5-item group 1 subdimension.

Person separation and person reliability of the 5-item group 1 were 2.37 and .85 respectively, whereas item separation and item reliability are 2.99 and .9 respectively (see Figure 16 in Appendix 21). Both person reliability and item reliability of the 5-item group 1 were considered high reliabilities because their values were greater than .8. Person separation index value, 2.37, was considered acceptable since it was higher than the minimum value of person separation, 2. Item separation index value, 2.99, was considered acceptable as it was barely lower than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 18 in Appendix 21 revealed that there was not satisfactory targeting for the 5-item group 1 subdimension because the mean logit measures of the participants' level of acculturative stress arising from the 5-item group 1 subdimension was found to have a deviation of -2.2 logits from the mean of item severity measures. Furthermore, group 1 showed a floor effect with about 21.5% (= 59/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about 1.5% (= 4/274) of the participants who achieved maximum scores (< 5% of the total sample).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Nonetheless, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress level arising from group 1 subdimension and were not addressed by items of any 5-item group 1 at the bottom of Figure 18 in Appendix 21. However, there was quite good coverage of the latent variable (i.e., acculturative stress arising from the 5-item group 1 subdimension) by the item thresholds from about -5.4 to 4.5 logits, as shown in Figure 18 in Appendix 21. On one hand, more items with lower severity should be added between -7 and -5.4 logits. On the other hand, one or two items with higher severity could be introduced between 4.5 and 5 logits to address some participants with higher acculturative stress level arising from group 1 subdimension.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.25 for the 4 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.39 to -.07 (see Figure 19 in Appendix 21) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.39) indicated that those two items only shared about 15% of the variance in their residuals in common (i.e., common variance = correlation^2); 85% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 5-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 20 in Appendix 21). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 5-item subdimension. In addition, the item severity hierarchy map was shown in Figure 17 in Appendix 21.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Taken together, the 5-item group 1 was a valid sub-dimension under Social Interaction dimension. As the content of the 5 items (Q81, Q83, Q84, Q89, and Q90) was related to loneliness, group 1 was renamed to Social Interaction: Loneliness.

Concerning group 2 subdimension, initial analysis of the 11 items revealed that its categories did not function well. Analysis of category structure in Figure 21 in Appendix 21 shows that the observed counts of all categories were more than 10. The observed averages monotonically increased from -2.82 to .74 across 5 categories. All category Outfit MNSQs were less than 2. Notwithstanding, thresholds (i.e., structure calibrations or step difficulties) did not monotonically increase by between 1.4 logits and 5 logits across categories 1 to 5: thresholds advanced from categories 3 to 4 and categories 4 to 5 by just 1.08 and .59 logit respectively. Figure 22 in Appendix 21 shows that category curves 3 and 4 did not exhibit distinct peaks, indicating that rating scale reorganization was needed. Three options to reorganize the 5-point ratings scale in group 2 subdimension were possible: combining either categories 3 and 4, categories 4 and 5, or even categories 2 and 3. Compared with last two options, the first option was adopted because its resulting category probability curve peaked more distinctly (see Figures 23, 24 and 25 in Appendix 21). Figure 26 in Appendix 21 presents the category structure after combining categories 3 and 4 to form a new category 3; the observed counts were all greater than 10; the observed averages increased monotonically across the 4 categories; all the category Outfit MNSQs were less than 2; thresholds advanced by between 1.4 and 5 logits. Moreover, Figure 23 in Appendix 21 depicts that all category probability curves exhibited distinct peaks after combining categories 3 and 4 to form a new category 3, and no peaks overlapped each other. All these results indicated that the reorganized 4-point rating scale categories of 11-item group 2 subdimension functioned well.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Analysis of item fitness, after combining categories 3 and 4, in Figure 27 in Appendix 21 shows that there were 5 item misfits. Items Q79, Q94, and Q80 were underfitted because either their Infit ZSTDs or their Outfit ZSTDs, or both were greater than 2 or equal to 2. Items 85 and 96 were overfitted because either their Infit ZSTDs or their Outfit ZSTDs, or both were less than -2 or equal to -2. Successively, adjusting 5 persons' responses (i.e., person numbers of 5, 81, 136, 198, and 220) to item Q79 to not applicable, 6 persons' responses (i.e., person numbers of 26, 81, 106, 195, 219, and 241) to item Q94 to not applicable, and 7 persons' responses (i.e., person numbers of 31, 141, 142, 183, 213, 220, and 272) to item Q80 to not applicable were performed (see Figures 27 to 34 in Appendix 21). After doing so, item statistics in Figure 33 in Appendix 21 shows that all items fell within acceptable bounds of MNSQs and ZSTDs. Therefore, the 11 items in group 2 were fit to the Rasch model.

Analysis of dimensionality in Figure 35 in Appendix 21 reveals that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.8, and the raw variance explained by the 11-item group 2 was 52.8%. The point-measure correlations of the 11-item group 2 were all above .5, ranging from .72 to .8 (see Figure 33 in Appendix 21); this demonstrated that the 11 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .65 to .78 (see Figure 36 in Appendix 21), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 11-item data set. These results indicated that the 11-item group 2 was underpinned by single dimension.

Re-analysis of category structure of 11-item group 2, after combining categories 3 and 4, and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80, shows that the four categories functioned well in Figure 37 in Appendix 21: observed counts greater than 10, monotonically increasing observed averages, category Outfit MNSQs less than 2, and structure calibrations advancing by between 1.4 and 5 logits. In addition, all category probability curves in Figure 38 in Appendix 21 exhibited distinct peaks, and no peaks overlapped. Hence, these results provided evidence that category structure of the 11-item group 2 worked fine.

Analysis of gender DIF, after combining categories 3 and 4, and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80, revealed that the 11-item group 2 had two statistically significant DIF items—Q79 and Q92 (see Figure 39 in Appendix 21). The Welch *t* probabilities of item Q79 and Q92 were .033 and .0382 respectively, less than the cutoff value of .05. Nonetheless, their corresponding absolute values of DIF contrasts were -.59 and .61, less than the cutoff value of .64. Hence, items Q79 and Q92 were not considered DIF items. As a result, there was no strong evidence that items in 11-item group 2 exhibited gender DIF.

After combining categories 3 and 4, and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80, person separation and person reliability of the 11-item group 2, were 2.54 and .87 respectively, whereas its item separation and item reliability were 3.36 and .92 respectively (see Figure 40 in Appendix 21). Both person reliability of .87 and item reliability of .92 were considered high reliability, i.e., above .8. Person separation index value, 2.54, was considered acceptable since it was a bit higher than the minimum value of person separation, 2. Item separation index value, 3.36, was considered good as it was higher than the good value of item separation, 3 that can at

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 42 in Appendix 21 reveals that there was not satisfactory targeting for the 11-item group 3 subdimension, after combining categories 3 and 4, and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80. It is because the mean logit measures of the participants' level of acculturative stress arising from the 11-item group 2 subdimension was found to have a deviation of -1.69 logits from the mean of item severity measures. Furthermore, group 2 showed a floor effect with about 10.2% (= 28/274) of the participants who attained minimum scores (> 5% of the total sample), although there was no ceiling effect with about .7% (= 2/274) of the participants who achieved maximum scores (< 5% of the total sample). Nevertheless, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress arising from group 2 subdimension and were not addressed by any group 2 items at the bottom of Figure 41 in Appendix 21. Anyhow, there was generally good coverage of the latent variable (i.e., acculturative stress arising from the group 2 subdimension) by the item thresholds from about -4 to 4.2 logits, as shown in Figure 42 in Appendix 21. On one hand, more items with lower severity should be added between -4 and -6 logits (as indicated in Figure 42 in Appendix 21) to address floor effect. On the other hand, one or two items with higher severity could be introduced between 4.2 and 5 logits to address some participants with higher acculturative stress level arising from group 2 subdimension.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.1 for the 11 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

pair ranged from about -.31 to .28 (see Figure 43 in Appendix 21) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.31) indicated that those two items only shared about 9.6% of the variance in their residuals in common (i.e., common variance = correlation^2); 90.4% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 11-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 44 in Appendix 21). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 11-item subdimension. In addition, the item severity hierarchy map was shown in Figure 41 in Appendix 21.

All things considered, the 11-item group 2 was a valid sub-dimension under Social Interaction dimension. The contents of the 11 items (items Q78-80, Q85-88, Q92, Q94, Q96, Q98) were more related to social interactions with mainland Chinese students and foreign students. Therefore, group 3 was renamed to Social Interaction: Limited Social Connectedness.

Concerning group 3 subdimension, initial analysis of the 7 items revealed that its categories did not function well. Analysis of category structure in Figure 45 in Appendix 21 shows that the observed counts of all categories were more than 10. The observed averages monotonically increased from -2.52 to 1.68 across 5 categories. All category Outfit MNSQs were less than 2. Notwithstanding, not all thresholds (i.e., structure calibrations or step difficulties) monotonically increased by between 1.4 logits and 5 logits across categories 1 to

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

5: thresholds advanced from categories 4 to 5 by just .08 logit. Figure 46 in Appendix 21 shows that the peak of category curve 4 was embedded on category curves 3 and 5. indicating that rating scale reorganization was needed. Two options to reorganize the 5-point ratings scale in group 3 subdimension were possible: combining either categories 3 and 4, or categories 4 and 5. Compared with second option, the first option was adopted because its resulting category probability curve peaked more distinctly (see Figures 47 and 48 in Appendix 21). Figure 49 in Appendix 21 presents the category structure after combining categories 3 and 4 to form a new category 3; the observed counts were all greater than 10; the observed averages increased monotonically across the 4 categories; all the category Outfit MNSQs were less than 2; thresholds advanced by between 1.4 and 5 logits. Moreover, Figure 47 in Appendix 21 depicts that all category probability curves exhibited distinct peaks after combining categories 3 and 4 to form a new category 3, and no peaks overlapped each other. All these results indicated that the reorganized 4-point rating scale categories of 7-item group 2 subdimension functioned well.

Analysis of item fitness, after combining categories 3 and 4, in Figure 50 in Appendix 21 shows that there were 2 item misfits. Item Q95 was underfitted because both its MNSQs and ZSTDs were greater than 1.4 and 2 respectively. Item Q101 was overfitted because its ZSTDs were less than -2. Item Q95, as an underfitting item, was first chosen to be edited or removed. Removing it trumped editing persons' responses to it, because deviations of ZSTDs from cutoff value of 2 were very large and the deviations of MNSQs from cutoff value of 1.4 were not very small. Figure 51 in Appendix 21 shows the item statistics after removing item Q95 and that there was only one overfitting item Q101; the overfitting item Q101 had a very small Infit ZSTD deviation of .1 from the cutoff value of -2 and the content of Q101 ("In Hong Kong, I do not have much social life.") was relevant to Social Interaction.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Therefore, the item Q101 was retained, and the 6 items in group 3 were considered fit to the Rasch model.

Analysis of dimensionality, after combining categories 3 and 4, and removing item Q95, reveals that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.6, and the raw variance explained by the 6-item group 3 was 59.5% (see Figure 52 in Appendix 21). Basically, these results indicated that the 11-item group 2 was unidimensional.

Analysis of category structure of 6-item group 3, after combining categories 3 and 4, and removing item Q95, depicts that the four categories functioned well in Figure 53 in Appendix 21: observed counts greater than 10, monotonically increasing observed averages, category Outfit MNSQs less than 2, and structure calibrations advancing by between 1.4 and 5 logits. In addition, all category probability curves in Figure 54 in Appendix 21 exhibited distinct peaks, and no peaks overlapped. Hence, these results provided evidence that category structure of the 6-item group 3 functioned well.

Analysis of gender DIF, after combining categories 3 and 4, and removing item Q95, indicates that the 6-item group 3 had two statistically significant DIF items—Q97 and Q100 (see Figure 55 in Appendix 21). The Welch *t* probabilities of item Q97 and Q100 were .0482 and .0222 respectively, less than the cutoff value of .05. Nonetheless, their corresponding absolute values of DIF contrasts were .58 and -.68. Hence, items Q97 was not considered a DIF item, whereas Q100 was a DIF item. After removing Q100, there were no more gender DIF items in the resulting 5-item group 3 (see Figure 56 in Appendix 21).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Analysis of item fitness, after combining categories 3 and 4, and removing items Q95 and Q100, illustrates that all items fall within the acceptable bounds of MNSQs and ZSTDs (see Figure 57 in Appendix 21). Hence, the 5 items in group 3 subdimension were fit to the Rasch model.

Analysis of dimensionality, after combining categories 3 and 4, and removing items Q95 and Q100, in Figure 58 in Appendix 21 verify that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.7, and the raw variance explained by the 5-item group 3 was 59.6%. In addition, the point-measure correlations of the 5-item group 3 were all above .5, ranging from .81 to .86 (see Figure 57 in Appendix 21); this demonstrated that the 5 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .79 to .84 (see Figure 59 in Appendix 21), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 5-item data set. These results indicated that the 5-item group 3 was underpinned by single dimension.

Analysis of category structure of 5-item group 3, after combining categories 3 and 4, and removing items Q95 and Q100, depicts that the four categories functioned well in Figure 60 in Appendix 21: observed counts greater than 10, monotonically increasing observed averages, category Outfit MNSQs less than 2, and structure calibrations advancing by between 1.4 and 5 logits. In addition, all category probability curves in Figure 61 in Appendix 21 exhibited distinct peaks, and no peaks overlapped. Hence, these results corroborated that category structure of the 5-item group 3 functioned well.

After combining categories 3 and 4, and removing items Q95 and Q100, person separation

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and person reliability of the 5-item group 3 were 1.94 and .79 respectively, whereas its item separation and item reliability were 3.35 and .92 respectively (see Figure 60 in Appendix 21). Person reliability of .79 was marginally below the cut-off value for high reliability of .8 or above. However, item reliability of .92 were considered high reliability, i.e., above .8. Person separation index value, 1.94, was considered barely acceptable since it was marginally below the minimum value of person separation, 2. Item separation index value, 3.35, was considered good as it was higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 62 in Appendix 21 reveals that there seems to be satisfactory targeting for the 5-item group 3 subdimension, after combining categories 3 and 4, and removing items Q95 and Q100. It is because the mean logit measures of the participants' level of acculturative stress arising from the 5-item group 3 subdimension was found to have a deviation of -.76 logits from the mean of item severity measures. Sign of a floor effect was evident for 12.4% (=34/274) of participants who attained minimum scores (> 5% of the total sample), although there was no ceiling effect with about 1.8% (= 5/274) of participants who achieved maximum scores (< 5% of the total sample). These results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress arising from group 3 subdimension and were not addressed by any group 3 items at the bottom of Figure 62 in Appendix 21. However, there was generally good coverage of the latent variable (i.e., acculturative stress arising from the group 3 subdimension) by the item thresholds from about -4.3 to 4.5 logits. On one hand, more items with lower severity should be added between -4.3 and -6 logits to address floor effect. On the other hand, one or two items with higher severity could be introduced between 4.5 and 6 to address some participants with higher acculturative stress level arising from group 3 subdimension.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.25 for the 5 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.46 to -.01 (see Figure 63 in Appendix 21) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.46) indicated that those two items only shared about 21% of the variance in their residuals in common (i.e., common variance = correlation^2); 79% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 5-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 64 in Appendix 21). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 5-item subdimension. In addition, the item severity hierarchy map was shown in Figure 61 in Appendix 21.

All things considered, the 5-item group 3 was a valid sub-dimension under Social Interaction dimension. The contents of the 5 items (items Q91, Q93, Q97, Q99, and Q101) were more related to social interactions with local students. Therefore, group 3 was renamed to Social Interaction: Hard to Make Friends with Hong Kong People.

4.4.6 Discrimination

The eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 2.8 (see Figure 1 in Appendix 22), which was greater than 2, suggesting that these 19

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

items did not constitute a unidimensional scale. Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 22) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 22), the Discrimination dimension were split into 4 groups: group 1 (items Q116, and Q118 to Q120), group 2 (items Q102, Q108, and Q117), group 3 (items Q104, Q106, Q110, Q111, and Q113 to Q115), and group 4 (items Q103, Q105, Q107, Q109, and Q112) for further examination.

Analysis of item fitness revealed that all MNSQs of 4-item group 1 were between .6 and 1.4 and all its ZSTDs fell within the acceptable bounds of -2 and 2 (see Figure 4 in Appendix 22). Hence, all the 4 items in group 1 were considered fit to the Rasch model.

Figure 6 in Appendix 22 shows that eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.8, and the raw variance explained by the 4-item group 1 was 68.7%. The point-measure correlations of the 4-item group 1 were all above .5, ranging from .79 to .9 (see Figure 4 in Appendix 22); this demonstrated that the 4 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .79 to .85 (see Figure 5 in Appendix 22), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 4-item data set. These results provided evidence that the 4-item group 1 was underpinned by single dimension.

Category structure of 4-item group 1 was shown fit to the Rasch model in Figure 7 in Appendix 22: observed counts greater than 10, observed average monotonically increasing, category Outfit MNSQs less than 2. Not all structure calibrations advanced by between 1.4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and 5 logits across the categories; the advancement of structure calibration from categories 4 to 5 was just 1.21 logits, less than 1.4 logits. On the other hand, all category probability curves in Figure 8 in Appendix 22 exhibited distinct peaks and no peaks were overlapped, though the peak of probability curve of category 4 was not sharp. Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, these results provided evidence that categories of the 4-item group 1 functioned appropriately in differentiating the acculturative stress level of participants due to group 1 and thus, were not subject to collapse.

Analysis of gender DIF revealed that the 4-item group 1 did not have any DIF item (see Figure 9 in Appendix 22). The Welch *t* probabilities were all much greater than .05; and the absolute values of all DIF contrasts were much less than .64. Measurement invariance was maintained across gender groups.

Person separation and person reliability of the 4-item group 1 were 1.7 and .74 respectively, whereas item separation and item reliability are 7.88 and .98 respectively (see Figure 10 in Appendix 22). Person reliability of .74 was considered moderate reliability, i.e., below .8. Item reliability of .98 was considered high reliability, i.e., above .8. Person separation index value, 1.7, was considered poor since it was lower than the minimum value of person separation, 2. Item separation index value, 7.88, was considered good as it was higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 12 in Appendix 22 revealed that there was not satisfactory targeting for the 4-item group 1 subdimension because the mean logit measures of the participants' level of

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

acculturative stress arising from the 4-item group 1 subdimension was found to have a deviation of -1.34 logit from the mean of item severity measures. Furthermore, group 1 showed a floor effect with about 14.6% (= 40/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about 4% (= 11/274) of the participants who achieved maximum scores (< 5% of the total sample). Nonetheless, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress level arising from group 1 subdimension and were not addressed by items of any 4-item group 1 located at the bottom of Figure 12 in Appendix 22. On one hand, more items with lower severity should be added between about -6 and -5 logits to address the floor effect. On the other hand, two or three items with higher severity could be introduced between about 4.8 and 5 logits to address some participants with higher acculturative stress level arising from group 1 subdimension. In any event, there was generally good coverage of the latent variable (i.e., acculturative stress arising from the 4-item group 1 subdimension) by the item thresholds from about -5 to 4.8 logits.

Regarding local dependence, based on the formula $-1/(L-1)$, where L is length of the dimension, the ideal value is approximately -.33 for the 4 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.52 to 0 (see Figure 13 in Appendix 22) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.52) indicated that those two items only shared about 27% of the variance in their residuals in common (i.e., common variance = correlation^2); 73% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Concerning the issue of item hierarchy, the construct keymap of this 4-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 14 in Appendix 22). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 4-item subdimension. In addition, the item severity hierarchy map was shown in Figure 11 in Appendix 22.

Taken together, the 4-item group 1 was a valid sub-dimension under Discrimination dimension. As the content of the 4 items (Q116, Q118, Q119, and Q120) was related to feeling rejected, group 1 was renamed to Discrimination—Feeling Rejected.

Regarding group 2 subdimension, Figure 15 in Appendix 22 shows that all MNSQs of 3-item group 2 were between .6 and 1.4, and all its ZSTDs, except Infit ZSTD of item Q117, fell within the acceptable bounds of -2 and 2. However, item Q117 was retained because first, its deviation of ZSTD from 2 was just very small, just .1. Second, based on item measures of all 3 items, there was no item with similar item measure as that of item Q117. As a result, removal of item Q117 would lower the test precision of group 2. Third, since MNSQs of item Q117 were acceptable, its ZSTD could be ignored (Linacre, 2012, p. 622). Hence, all the 3 items in group 2 were considered fit to the Rasch model.

Figure 17 in Appendix 22 reveals that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.6, and the raw variance explained by the 3-item group 2 was 72.3%. The point-measure correlations of the 3-item group 2 were all above .5, ranging from .87 to .92 (see Figure 15 in Appendix 22); this demonstrated that the 3 items were oriented in the same direction as the measure. As indications of item

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

discrimination, the point-biserial correlations ranged from .85 to .9 (see Figure 16 in Appendix 22), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 3-item data set. These results indicated that the 3-item group 2 was underpinned by single dimension.

Category structure of group 2 was shown fit to Rasch model in Figure 18 in Appendix 22: observed counts greater than 10, observed average monotonically increasing, category Outfit MNSQs less than 2, and structure calibrations advancing by between 1.4 and 5 logits. In addition, all category probability curves in Figure 19 in Appendix 22 exhibited distinct peaks, and no peaks were overlapped, although the peak of category probability curve of category 4 was not very sharp. In any event, these results provided evidence that category structure of the 3-item group 2 worked fine.

Analysis of gender DIF revealed that the 3-item group 2 had two DIF items—Q102 and Q117 (see Figure 20 in Appendix 22). The Welch *t* probability of item Q102 was .0274, much smaller than .05; and the DIF contrast of item Q102 was .7, greater than .64. The Welch *t* probability of item Q117 was .0099, much smaller than .05; and the DIF contrast of item Q117 was -.98, much smaller than -.64. To maintain measurement invariance, items Q102 and Q117 would be removed. After doing so, the revised group 2 would become a single item subdimension, which rendered Rasch analysis of group 2 meaningless. As a result, group 2 was discarded.

Regarding group 3 subdimension, Figure 21 in Appendix 22 shows the category structure of 7-item group 3. All the observed counts were greater than 10. The observed averages increased across 5 categories. The Outfit MNSQs were all less than 2. The increments of

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

structure calibrations were within 1.4 to 5 logits across categories 1 to 4; however, the increment of structure calibration from categories 4 to 5 was just .82 logit, much less than 1.4 logits. Also, the diagram of category probability curves of group 3 shows that the peak of category probability curve of category 4 was not distinctly clear (see Figure 22 in Appendix 22). In addition, analysis of item fitness indicated that there were two misfit items: Q110 with Infit MNSQ= 1.51 and Infit ZSTD= 3.6; and Q115 with Infit ZSTD= -2.1 (see Figure 23 in Appendix 22). Since the number of items in group 3 were not many, preserving items trumped collapsing category.

There were two options to collapse category 4: combining categories 4 and 5, or combining categories 3 and 4. The resulting category structures and probability curves are shown in Figures 24 to 27 in Appendix 22. In the case of combining categories 4 and 5, Figure 24 in Appendix 22 revealed that the structure calibration advanced by less than 1.4 logits from categories 3 to 4, and Figure 25 in Appendix 22 showed that the peak of probability curve of category 3 was not very sharp. On the other hand, in the case of combining categories 3 and 4, all structure calibrations advanced by between 1.4 and 5 logits (see Figure 26 in Appendix 22), and the peak of probability curve of category 3 was clearly distinct and sharp (see Figure 27 in Appendix 22). Given that observed counts, observed averages, and Outfit MNSQs in two combinations met Linacre's (1999) guideline on optimizing rating scale category effectiveness, the combining categories 3 and 4 trumps combining categories 4 and 5 in terms of increments of structure calibration.

After combining categories 3 and 4, analysis of item fitness was performed. Figure 28 in Appendix 22 depicts that only one item, Q110, behaved misfit because its Infit ZSTD was greater than 2. After changing 3 odd or strange person responses to item Q110 to non-

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

applicable, i.e., person numbers 34, 57, and 149 (see Figure 29 in Appendix 22), there was no misfitting item in the 7-item group 3 subdimension (see Figure 30 in Appendix 22).

Figure 31 in Appendix 22 shows that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.8, and the raw variance explained by the 7-item group 3 was 62.6%. The point-measure correlations of the 7-item group 3 were all above .5, ranging from .79 to .86 (see Figure 30 in Appendix 22); this demonstrated that the 7 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .75 to .83 (see Figure 32 in Appendix 22), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 7-item data set. These results indicated that the 7-item group 3 was underpinned by single dimension.

Figure 33 in Appendix 22 shows the category structure of the 7-item group 3 after combining categories 3 and 4, and editing 3 odd person responses to item Q110. The observed counts were all greater than zero; the observed averages monotonically increased across 4 categories; the Outfit MNSQs were all less than 2; all structure calibrations advanced by between 1.4 and 5 logits. In addition, the category probability curves showed clear and distinct peaks, none of which were overlapped (Figure 34 in Appendix 22). Hence, the category structure functions well.

Analysis of gender DIF in the 7-item group 3 revealed that there was no DIF item at all: all Welch *t* probabilities were greater than .05, and all DIF contrasts were less than absolute value of .64 (see Figure 35 in Appendix 22).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Person separation and person reliability of the 7-item group 3 were 2.02 and .8 respectively, whereas item separation and item reliability are 4.31 and .95 respectively (see Figure 36 in Appendix 22). Person reliability of .8 was considered barely high reliability, i.e., reaching .8. Item reliability of .95 was considered very high reliability, i.e., much above .8. Person separation index value, 2.02, was considered acceptable since it reached the minimum value of person separation, 2. Item separation index value, 4.31, was considered very good as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 38 in Appendix 22 revealed that there was not satisfactory targeting for the 7-item group 3 subdimension because the mean logit measures of the participants' level of acculturative stress arising from the 7-item group 3 subdimension was found to have a deviation of -2.03 logits from the mean of item severity measures. Furthermore, group 3 showed a floor effect with about 17.2% (= 47/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about 1.5% (= 4/274) of the participants who achieved maximum scores (< 5% of the total sample). Nevertheless, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress arising from group 3 subdimension and were not addressed by any group 3 items at the bottom of Figure 38 in Appendix 22. One higher severity item might be introduced between 4.8 and 5 logits to address some participants with higher level of acculturative stress, and specifically, more lower severity items should be between -6 and -5 logits to address the floor effect. Nonetheless, there was generally good coverage of the latent variable (i.e., acculturative stress arising from the group 3 subdimension) by the item thresholds from -5 to 4.8 logits.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.17 for the 7 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.36 to .17 (see Figure 39 in Appendix 22) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.36) indicated that those two items only shared about 13% of the variance in their residuals in common (i.e., common variance = correlation^2); 87% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 7-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 40 in Appendix 22). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 7-item subdimension. In addition, the item severity hierarchy map was shown in Figure 37 in Appendix 22.

Taken together, the 7-item group 3 was a valid sub-dimension under Discrimination dimension. The contents of the 7 items (Q104, Q106, Q110, Q111, Q113, Q114, and Q115) were related to stereotypes of other people. Therefore, group 3 was renamed to Discrimination: Stereotypes.

For the final 5-item group 4, the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.6, and the raw variance explained by group 4 was 73.9% (see Figure 41 in Appendix 22). Therefore, these results provided evidence that group 4 was a unidimensional subdimension.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Concerning category structure of 5-item group 4, Figure 42 in Appendix 22 shows that observed counts were all greater than zero; observed averages increased monotonically across 5 categories; Outfit MNSQs were all less than 2; and structure calibrations advanced by between 1.4 and 5 logits across 5 categories (see Figure 42 in Appendix 22). In addition, category probability curves showed that all categories had distinct peaks, and no peaks were overlapped (see Figure 43 in Appendix 22).

Analysis of item fitness in Figure 44 in Appendix 22 shows that there were 2 item misfits: Q112 with Infit ZSTD greater than 2, and Q105 with both Infit ZSTD and Outfit ZSTD less than -2. Although Q112 was an underfit item, it was preferable to retain it because only 5 items in group 4. In any event, some odd person responses to Q112 were corrected in order to make its Infit ZSTD to fall within the acceptable bounds. Two aberrant persons' responses to Q112 were adjusted to non-applicable, namely, persons 7 and 156 (see Figure 45 in Appendix 22). The resulting analysis of item fitness was shown in Figure 46 in Appendix 22, indicating that there was only one misfit item left behind, i.e., item Q105, whose Outfit ZSTD was less than -2. Since item Q105 had MNSQs less than 1, item Q105 was too predictable and there were no unexpected responses (see Figure 47 in Appendix 22). As a result, item Q105 was somewhat redundant, and could be removed to shorten this 5-item group 4. However, group 4 had only 5 items, including item Q105, and did not have item with similar level of measure as that of item Q105. Moreover, the deviation of Outfit ZSTD from cut-off value of -2 was not big, just about .5. As long as MNSQs stayed within the acceptable bounds, ZSTDs could be ignored (Linacre, 2012, p. 622). Therefore, item Q105 was retained.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Gender DIF analysis in Figure 48 in Appendix 22 shows that there were 2 DIF items, namely, items Q103 and Q112. Their Welch *t* probabilities and absolute values of DIF contrasts were less than .05 and greater than .64 respectively. Since item Q112 had a large absolute value of DIF contrast as well as smaller Welch *t* probability, item Q112 was removed. The updated gender DIF analysis is shown in Figure 49 in Appendix 22 after removing item Q122. No gender DIF was found as all Welch *t* probabilities were much greater than .05 and absolute values of all DIF contrasts were much less than .64.

Analysis of item fitness was reassessed, after removing item Q122. Figure 50 in Appendix 22 reveals that there was no item underfit, but an item overfit—Q105, the ZSTDs of which were less than -2. Since item Q105 had MNSQs less than 1, item Q105 was too predictable and there were no unexpected responses. As a result, item Q105 was somewhat redundant, and could be removed to shorten this 4-item group 4. However, group 4 had only 4 items, including item Q105, and did not have item with similar level of measure as that of item Q105. Moreover, both the deviations of ZSTDs from cut-off value of -2 were not big, less than .7. As long as MNSQs stayed within the acceptable bounds, ZSTDs could be ignored (Linacre, 2012, p. 622). Item Q105 was hence retained, and the 4 items in group 4 were considered fit to the Rasch model.

Analysis of dimensionality depicted that the eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.7, and the raw variance explained by group 4 was 73.3% (see Figure 51 in Appendix 22). The point-measure correlations of the 4-item group 4 were all above .5, ranging from .9 to .92 (see Figure 50 in Appendix 22); this demonstrated that the 4 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .86 to .93 (see

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 52 in Appendix 22), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 4-item data set. These results indicated that the 4-item group 4 was underpinned by single dimension.

Figure 53 in Appendix 22 shows the category structure of the 4-item subdimension. All observed counts were greater than zero. The observed averages increased monotonically across 5 categories. The Outfit MNSQs were all less than 2. The structure calibrations advanced by between 1.4 and 5 logits across categories 3 to 5. However, the increment from categories from 2 to 3 was 5.48 logits, greater than cutoff value of 5 logits. Nonetheless, the diagram depicting category probability curves of the 4-item group 4 indicates that all such curves exhibited a distinct peak and no peaks were overlapped (Figure 54 in Appendix 22). Taken together, the 5-category rating scale of the 4-item group 4 functioned well.

Person separation and person reliability of the 4-item group 4 were 1.99 and .8 respectively, whereas item separation and item reliability are 2.87 and .89 respectively (see Figure 55 in Appendix 22). Person reliability of .8 was considered barely high reliability, i.e., reaching .8. Item reliability of .89 was also considered high reliability, i.e., above .8. Person separation index value, 1.99, was considered barely poor since it was just a bit lower than the minimum value of person separation, 2. Item separation index value, 2.87, was considered acceptable as it was not higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 57 in Appendix 22 revealed that there was not satisfactory targeting for the 4-item group 4 subdimension because the mean logit measures of the participants' level of acculturative stress arising from group 4 subdimension was found to have a deviation of -2.79

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

logits from the mean of item severity measures. Furthermore, group 4 showed a floor effect with about 23.7% (= 65/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about 2.2% (= 6/274) of the participants who achieved maximum scores (< 5% of the total sample). Nevertheless, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress arising from group 4 subdimension and were not addressed by any group 4 items at the bottom of Figure 57 in Appendix 22. One or two severity items might be introduced between 5.5 and 6 logits to address some participants with higher level of acculturative stress, and more lower severity items should be added between -8 and -7 logits to address the floor effect. In addition, there was good coverage of the latent variable (i.e., acculturative stress arising from the group 4 subdimension) by the item thresholds from about -7 to and 5.5 logits.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.33 for the 4 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.55 to -.12 (see Figure 58 in Appendix 22) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.55) indicated that those two items only shared about 30% of the variance in their residuals in common (i.e., common variance = correlation^2); 70% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 4-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 59 in Appendix

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

22). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 4-item subdimension. In addition, the item severity hierarchy map was shown in Figure 56 in Appendix 22.

Taken together, the 4-item group 4 was a valid sub-dimension under Discrimination dimension. As the contents of the 4 items (Q103, Q105, Q107, and Q109) were related to negative attitudes of other people, group 4 was renamed to Discrimination: Negative Attitudes.

4.4.7 Homesickness

The eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 3.4 (see Figure 1 in Appendix 23), which was greater than 2, suggesting that these 14 items did not constitute a unidimensional scale. Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 23) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 23), the Homesickness dimension were split into 4 groups: group 1 (items Q129 and Q130), group 2 (items Q126 and Q127), group 3 (items Q131 to Q134), and group 4 (items Q121-Q125, and Q128) for further examination.

Figure 4 in Appendix 23 shows that both item separation and reliability of group 1 were zero, indicating that items of group 1 could not differentiate the persons, and was an unreliable scale. Hence, group 1 was discarded.

Figure 5 in Appendix 23 reveals that person reliability of group 2 was .34, a low value of reliability, indicating that group 2 was not a reliable scale. Hence, group 2 was also

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

discarded.

Figure 6 in Appendix 23 shows that eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.6, and the raw variance explained by the 4-item group 3 was 70.8%. These results provided evidence that the 4-item group 3 was unidimensional.

Category structure of group 3 was shown fit to Rasch model in Figure 7 in Appendix 23: observed counts greater than 10, observed average monotonically increasing, category Outfit MNSQs less than 2, and structure calibrations advancing by between 1.4 and 5 logits. In addition, all category probability curves in Figure 8 in Appendix 23 exhibited distinct peaks, and no peaks were overlapped. These results provided evidence that category structure of the 4-item group 3 worked fine.

Analysis of item fitness showed that all MNSQs of 4-item group 3 were all between .6 and 1.4; however, item Q132 displayed its ZSTDs being less than -2, exhibiting misfit (Figure 9 in Appendix 23). As shown in Figure 10 in Appendix 23, there were no other items at the same level of severity as that of item Q132; deleting it would be likely to undermine test precision. Hence, Q132 was kept.

Analysis of gender DIF revealed that the 4-item group 3 had a DIF item—Q134 (see Figure 11 in Appendix 23). The Welch *t* probability of item Q134 was .0033, much smaller than .05; and the DIF contrast of item Q134 was .81, much greater than .64. To maintain measurement invariance, item Q134 was removed. After doing so, there was no DIF item in revised Group 3 (see Figure 12 in Appendix 23).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Re-analysis of item fitness showed that all MNSQs of 3-item group 3 were between .6 and 1.4; two items—Q133 and Q132— had their ZSTDs greater than 2 and less than -2 respectively this time round (see Figure 13 in Appendix 23). Anyhow, they were retained because their item severity measures were not close to each other (see Figures 13 and 18 in Appendix 23). Therefore, removing them not only would be likely to undermine test precision, but also caused the 3-item group 3 to become a one-item scale. Moreover, since "mean-squares are acceptable, then ZSTD can be ignored" (Linacre, 2012, p. 622).

Once again. category structure of the 3-item group 3 was found fit to Rasch model (see Figure 14 in Appendix 23): observed counts greater than 10, observed average monotonically increasing, category Outfit MNSQs less than 2, and structure calibrations advancing by between 1.4 and 5 logits. Moreover, all category probability curves in Figure 15 in Appendix 23 displayed distinct peaks, and no peaks were overlapped. These results corroborated that category structure of the 3-item group 3 functioned well.

Figure 15 in Appendix 23 shows that eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.7, and the raw variance explained by the 3-item group 3 was 72%. The point-measure correlations of the 3-item group 3 were all above .5, ranging from .89 to .94 (see Figure 13 in Appendix 23); this demonstrated that the 3 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .89 to .92 (see Figure 16 in Appendix 23), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 3-item data set. These results indicated that the 3-item group 3 was underpinned by single dimension.

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Person separation and person reliability were 1.9 and .78 respectively, whereas item separation and item reliability are 3.67 and .93 respectively (see Figure 17 in Appendix 23). Person reliability of .78 was considered moderate reliability, i.e., below .8. Item reliability of .93 was considered high reliability, i.e., above .8. Person separation index value, 1.9, was considered poor since it was lower than the minimum value of person separation, 2. Item separation index value, 3.67, was considered good as it was higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 19 in Appendix 23 revealed that there was not satisfactory targeting for the 3-item group 3 subdimension because the mean logit measures of the participants' level of acculturative stress arising from the 3-item group 3 subdimension was found to have a deviation of -1.4 logit from the mean of item severity measures. Furthermore, group 3 showed a floor effect with about 16.4% (= 45/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about 4.7% (= 13/274) of the participants who achieved maximum scores (< 5% of the total sample). Hence, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress arising from group 3 subdimension and were not addressed by any group 3 items at the bottom of Figure 19 in Appendix 23. A few higher severity items should be introduced between 5.6 and 6 logits to address the participants with higher levels of acculturative stress, and more lower severity items should be added between -6 and -5.8 logits Nonetheless, there was generally good coverage of the latent variable (i.e., acculturative stress arising from the group 3 subdimension) by the item thresholds from -5.8 to 5.6 logits.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.5 for the 3 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.63 to -.32 (see Figure 20 in Appendix 23) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.63) indicated that those two items only shared about 40% of the variance in their residuals in common (i.e., common variance = correlation^2); 60% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 3-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 21 in Appendix 23). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 3-item subdimension. In addition, the item severity hierarchy map was shown in Figure 18 in Appendix 23.

Taken together, the 3-item group 3 was a valid sub-dimension under Homesickness dimension. However, the content of the 3 items (Q131, Q132, and Q133) were related to family responsibility rather than homesickness. Therefore, group 3 was renamed to Family Responsibility as a single dimension.

The final 6-item group 4 (items Q121 to Q125, and Q128) subdimension was under examination for item fitness. Figure 22 in Appendix 23 shows that item Q123 had both unacceptable MNSQs being greater than 1.4 and ZSTDs being greater than 2. After

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

removing item Q123, another item Q122 was found to be an underfit item with ZSTDs greater than 2, though its MNSQs were less than 1.4 (see Figure 23 in Appendix 23). After editing just 3 extremely deviated person responses to non-applicable in relation to item Q122, i.e., person numbers 13, 134, and 160 (see Figure 24 in Appendix 23), there was no underfitting item in the revised 5-item group 4 subdimension (see Figure 25 in Appendix 23). Nonetheless, overfitting item Q125 had Infit ZSTD slightly less than -2, and was retained because (1) it was a very slightly deviation Infit ZSTD by .1, (2) there was no item with the same severity level (i.e., item measure) as that of item Q125; removing it would likely harm the test precision, (3) since MNSQs were greater than .6 and acceptable, then "ZSTD can be ignored" (Linacre, 2012, p. 622). As a result, the 5 items in revised group 4 were considered fit to the Rasch model.

Figure 26 in Appendix 23 shows that the eigenvalue of the first contrast was 1.6, and the raw variance explained by this 5-item group 4 was 72.7%. The point-measure correlations of this 5-item group 4 were all above .5, ranging from .88 to .92 (see Figure 25 in Appendix 23); this demonstrated that the 5 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .88 to .92 (see Figure 27 in Appendix 23), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 5-item data set. These results indicated that the 5-item group 4 was underpinned by single dimension.

Analysis of category structure of the 5-item group 4 confirmed that the 5-point categories functioned well: the observed counts were all greater than 10; the observed category averages increased with 5 categories, category Outfit MNSQs were all less than 2 logits; category thresholds increased with 5 categories and advanced by between 1.4 logits and 5 logits (see

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 28 in Appendix 23); and probability curve of each category was peaked, and the peaks did not overlap (see Figure 29 in Appendix 23).

Analysis of gender DIF in the 5-item group 4 revealed that there was no DIF item at all: all Welch *t* probabilities were much greater than .05, and all DIF contrasts were less than absolute value of .64 (see Figure 30 in Appendix 23).

Person separation and person reliability of the 5-item group 4 were 2.39 and .85 respectively, whereas its item separation and item reliability were 4.25 and .95 respectively (see Figure 31 in Appendix 23). Both person and item reliabilities were good, i.e., above .8. Person separation index value, 2.39, was considered fair since it was just greater than the minimum value of person separation, 2. Item separation index value, 4.25, was considered very good as it was much greater than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 33 in Appendix 23 revealed that there was not satisfactory targeting for the 5-item group 4 because the mean logit measures of the participants' level of acculturative stress arising from group 4 subdimension was found to have a deviation of -2.15 logits from the mean of item severity measures. Furthermore, group 4 showed a floor effect with about 19% (= 52/274) of the participants who attained minimum scores (> 5% of the total sample), but no ceiling effect was found because only about 2.6% (= 7/274) of the participants who achieved maximum scores (< 5% of the total sample). In any event, these results represented an inadequate item to person targeting, more items should be introduced between -8 and -6.5 logit to address the floor effect. One or two items could be added between 6 and 7 logits to address some participants with higher level of acculturative stress. Nonetheless, there was

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

generally good coverage of the latent variable (i.e., acculturative stress arising from group 4 subdimension) by the item thresholds from about -6.8 to 6 logits.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.25 for the 5 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.38 to 0 (see Figure 34 in Appendix 23) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.38) indicated that those two items only shared about 14% of the variance in their residuals in common (i.e., common variance = correlation^2); 86% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 5-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 35 in Appendix 23). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 5-item subdimension. In addition, the item severity hierarchy map was shown in Figure 32 in Appendix 23.

Taken together, the 5-item group 4 was the only valid sub-dimension left behind within Homesickness dimension. According to the content of the 5 items (Q121, Q122, Q124, Q125, and Q128), group 4 was renamed to Homesickness.

4.4.8 Career Prospects

The eigenvalue of the first contrast in the principal components analysis of Rasch residuals

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

was 2.6 (see Figure 1 in Appendix 24), which means that these 13 items did not constitute a unidimensional scale, having the threshold value greater than 2 eigenvalue units in the first contrast. Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 24) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 24), the Career Prospects dimension were split into 2 groups: group 1 (items Q142 to Q147) with negative item loadings, and group 2 (items Q135 to Q141) with positive item loadings, for further examination.

Figure 4 in Appendix 24 initially shows that group 1 could explain 64.3% of the raw variance and the eigenvalue of the first contrast of the principal component analysis of Rach residuals was 1.9, indicating that the 6 items in group 1 constitute a unidimensional scale. Figure 5 in Appendix 24 reveals the category structure of group 1 to be working fine: all observed counts being greater than 10, observed average monotonically increasing across 5 categories, and structure calibrations advancing by between 1.4 and 5 logits across 5 categories. Besides, Figure 6 in Appendix 24 shows that the category probability curves had distinct peaks. Nonetheless, item fitness was not up to par. Figure 6 in Appendix 24 shows that item Q146 was a misfit item because of MNSQs being greater than 1.4 and absolute values of ZSTDs being greater than 2, and item Q144 was another misfit item because of absolute values of ZSTDs being greater than 2. After removing item Q146, another pair of misfit items, Q147 and Q144, were found in Figure 7 in Appendix 24 because of their absolute values of ZSTDs being greater than 2. Since item Q147 had larger absolute value of ZSTDs, it was removed to result in 4 items as shown in Figure 8 in Appendix 24, in which item Q144 was found to have its absolute values of ZSTDs greater than 2. However, reading the content of the four question items, item Q142 ("I am worried about whether I can find a job in mainland China

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

after graduation.") was related to whether participants could secure jobs in mainland China, whereas the remaining 3 items were related to whether the knowledge participants gained in Hong Kong could be applicable to Hong Kong, mainland China, or foreign countries. In addition, removing item Q142 would not likely to affect the test precision of group 1 because items Q142 and Q143 had very close item measures (i.e., item severities or difficulties) and almost duplicated each other as indicated in person-item map (see Figure 9 in Appendix 24). After removing item Q142, all remaining 3 items—Q143, Q144, and Q145— in group 1 were found fit to the Rasch model: their MNSQs were close to 1 and ZSTDs were less than 2 (see Figure 10 in Appendix 24).

Figure 11 in Appendix 24 reveals that eigenvalue of the first contrast in the principal components analysis of Rasch residuals was 1.6, and the raw variance explained by the 3-item group 1 was 73.1%. The point-measure correlations of the 3 items were all positive and above .5, ranging from .91 to .93 (see Figure 10 in Appendix 24); this demonstrated that the 3 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .86 to .92 (see Figure 19 in Appendix 24), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 3-item data set. These results corroborate that 3-item group 1 was unidimensional.

Category structure of group 1 was shown fit to Rasch model in Figure 12 in Appendix 24: observed counts greater than 10, observed average monotonically increasing, category Outfit MNSQs less than 2, and structure calibrations advancing by between 1.4 and 5 logits. In addition, all category probability curves in Figure 13 in Appendix 24 exhibited distinct peaks. These results provided evidence that category structure of the 3-item group 1 worked fine.

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Analysis of gender DIF confirmed that the 3-item group 1 did not have any DIF item: Welch *t* probabilities being much greater than .05, and DIF contrasts were much smaller than absolute value of .64 (see Figure 13 in Appendix 24).

Person separation and person reliability were 1.89 and .78 respectively, whereas item separation and item reliability are 3.53 and .93 respectively (see Figure 14 in Appendix 24). Person reliability of .78 was considered moderate reliability, i.e., below .8. Item reliability of .93 was considered high reliability, i.e., above .8. Person separation index value, 1.89, was considered poor since it was lower than the minimum value of person separation, 2. Item separation index value, 3.53, was considered good as it was higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 16 in Appendix 24 revealed that there was not satisfactory targeting for the 3-item group 1 because the mean logit measures of the participants' level of acculturative stress arising from group 1 subdimension was found to have a deviation of -1.16 logit from the mean of item severity measures. Furthermore, group 1 showed a floor effect with about 18.6% (= 51/274) of the participants who attained minimum scores (> 5% of the total sample), whereas there was no ceiling effect with about 4.7% (= 13/274) of the participants who achieved maximum scores (< 5% of the total sample). Hence, these results represented an inadequate item to person targeting, particularly for those participants who had lower or no acculturative stress arising from group 1 subdimension and were not addressed by any group 3 items located at the bottom of Figure 16 in Appendix 24. More items with less severity level could be added between -7 and -6.6 logits to address the floor effects. A few

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

items could be put between 5.5 and 6 logits to address some participants with higher level of acculturative stress. Nonetheless, there was generally good coverage of the latent variable (i.e., acculturative stress arising from group 1 subdimension) by the item thresholds from -6.6 to 5.5 logits.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.5 for the 3 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.59 to -.45 (see Figure 17 in Appendix 24) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.59) indicated that those two items only shared about 35% of the variance in their residuals in common (i.e., common variance = correlation^2); 65% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 3-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 18 in Appendix 24). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 3-item subdimension. In addition, the item severity hierarchy map was shown in Figure 15 in Appendix 24.

Taken together, the 3-item group 1 was a valid sub-dimension under Career Prospects dimension. According to the content of the 3 items (Q143, Q144, and Q145), group 1 was renamed to Career Prospects: Application of Knowledge.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Another subdimension group 2 was under examination. Analysis of item fitness found 3 misfit items—Q135, Q138 and Q140 (see Figure 20 in Appendix 24), all of which had absolute values of ZSTDs greater than 2. Since item Q140 was the only underfit item, and its content was mainly about deciding whether to study or work after graduation rather than where to develop one's career or secure a job upon graduation, it was picked for removal. Besides, Figure 21 in Appendix 24 shows that items Q140 and Q139 were at the same level of scale performance. As such, removal of item Q140 would not likely to reduce test precision. After taking out item Q140, the resulting item statistics of group 2 as shown in Figure 22 in Appendix 24 reveals that all MNSQs fell between .6 and 1.4. Although items Q138 and Q135 had absolute values of ZSTDs greater than 2, both of them were consistent with other items in group 2 with respect to the worry about where to develop one's career upon graduation, and hence were retained. Therefore, the 6-item group 2 comprising items Q135, Q136, Q137, Q138, Q139, and Q141 were considered fit to the Rasch model.

Figure 23 in Appendix 24 shows that the eigenvalue of the first contrast was 1.7, and the raw variance explained by the 6-item group 2 was 69.3%. The point-measure correlations of the 6-item group 2 were all above .5, ranging from .87 to .92 (see Figure 22 in Appendix 24); this demonstrated that the 6 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .81 to .9 (see Figure 24 in Appendix 24), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 6-item data set. These results indicated that the 6-item group 2 was underpinned by single dimension.

Analysis of category structure of the 6-item group 2 confirmed that the 5-point categories functioned well: the observed counts were all greater than 10; the observed category averages

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

increased with 5 categories, category Outfit MNSQs were all less than 2 logits; category thresholds increased with 5 categories and advanced by between 1.4 logits and 5 logits (see Figure 25 in Appendix 24); and probability curve of each category was peaked, and the peaks did not overlap (see Figure 26 in Appendix 24).

Analysis of gender DIF in the 6-item group 2 revealed that there was no DIF item: all Welch *t* probabilities, except that of item Q137, were much greater than .05. Nonetheless, all DIF contrasts were less than absolute value of .64 (see Figure 27 in Appendix 24).

Person separation and person reliability of the 6-item group 2 were 2.53 and .86 respectively, whereas its item separation and item reliability were 2.12 and .82 respectively (see Figure 28 in Appendix 24). Both person and item reliabilities were good, i.e., above .8. Person separation index value, 2.53, was considered fair since it was greater than the minimum value of person separation, 2. Item separation index value, 2.12, was considered fair as it was less than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Figure 30 in Appendix 24 revealed that there seems to be satisfactory targeting for the 6-item group 2 because the mean logit measures of the participants' level of acculturative stress arising from group 2 subdimension was found to have a deviation of -.76 logit from the mean of item severity measures. However, group 2 showed a floor effect with about 10% (= 28/274) of the participants who attained minimum scores (> 5% of the total sample), and a ceiling effect with about 5.1% (= 14/274) of the participants who achieved maximum scores (> 5% of the total sample). Hence, these results represented an inadequate item to person targeting, more items with less severity should be introduced between -6 and -5 logits to

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

address the floor effect. Also, some items with higher severity could be added between 4.2 and 6 logits to address some participants with higher level of acculturative stress. Nonetheless, there was generally good coverage of the latent variable (i.e., acculturative stress arising from group 2 subdimension) by the item thresholds from -5 to 4.2 logits.

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.2 for the 6 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.42 to .16 (see Figure 31 in Appendix 24) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.42) indicated that those two items only shared about 18% of the variance in their residuals in common (i.e., common variance = correlation^2); 82% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 6-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 32 in Appendix 24). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 6-item subdimension. In addition, the item severity hierarchy map was shown in Figure 29 in Appendix 24.

Taken together, the 6-item group 1 was a valid sub-dimension under Career Prospects dimension. According to the content of the 6 items (Q135, Q136, Q137, Q138, Q139, and Q141), group 2 was renamed to Career Prospects: Where to Develop One’s Career.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

4.4.9 Accommodation

Initial analysis of item fitness the 8-item Accommodation dimension revealed that there was an underfitting item, Q154, with its both MNSQs and ZSTDs beyond the acceptable bounds (see Figure 1 in Appendix 25). After removing item Q154, another underfitting item with large value of Outfit ZSTD, Q155, emerged (see Figure 2 in Appendix 25). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Since the Outfit MNSQ of item Q155 was below 1.4, item Q155 was not removed. On the other hand, there was an overfitting item, Q150, with both its MNSQs and ZSTDs beyond the acceptable limits (see Figure 2 in Appendix 25). Removing item Q150 resulted in Figure 3 in Appendix 25, which shows that the MNSQs of all 6 remaining items were above .6 and below 1.4; even though an overfitting item, Q149, had both its ZSTDs small than -2, the remaining 6 items were considered fit to the Rasch model (Linacre, 2012).

Figure 4 in Appendix 25 reveals that the eigenvalue of the first contrast of the principal components analysis of Rasch residuals in the 6-item Accommodation dimension was 1.8, and the raw variance explained by Accommodation dimension was 65.7%. These two essential pieces of evidence corroborated that the 6-item Accommodation dimension was underpinned by single dimension.

As shown in Figure 5 in Appendix 25, the category structure of 6-item Accommodation dimension, after removal of items Q154 and Q150, displayed that all the observed counts were greater than 10, that the observed averages monotonically increased across the 5 categories, and that all outfit MNSQs were less than 2. Although these results met the Linacre's (1999) guidelines of an effective rating scale, not all did the structure calibrations advance by between 1.4 and 5 logits across the 5 categories. The increment of structure

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

calibration from categories 4 to 5 was just 1.25 logits. Nonetheless, probability curve of each category was peaked, and the peaks did not overlap (see Figure 6 in Appendix 25). Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale works best. Taken together, the category functioning results supported the use of the five-point rating scale in this 6-item Accommodation dimension.

Analysis of gender DIF in the 6-item Accommodation dimension (see Figure 7 in Appendix 25) revealed that items Q148 and Q152 exhibited DIF as a function gender because of low values of Welch *t* probability and large corresponding absolute values of DIF contrast. Item Q148 was removed first, due to its larger absolute value of DIF contrast, to result in new gender DIF analysis as shown in Figure 8 in Appendix 25 in which item Q152 was a potential gender DIF item. Although item Q152 had a low Welch *t* probability of .0072 (much less than .05), its DIF contrast of .61 was less than .64. Therefore, item Q152 was not removed, and these 5 items were considered free of gender DIF.

Re-analysis of item fitness of Accommodation dimension with the 5 remaining items demonstrated that all MNSQs were between 0.6 and 1.4, even though there was an overfitting item Q149 with its ZSTDs less than or equal to -2 (see Figure 9 in Appendix 25). According to Linacre (2012, p. 622), when MNSQ of an item is acceptable, its ZSTD can be ignored. Therefore, these 5 items were regarded as fit to the Rasch model.

Re-analysis of dimensionality of Accommodation dimension with the 5 remaining items showed that the eigenvalue of the unexplained variance in the first contrast was 1.7 and the raw variance explained by Rasch measures were 65%. These results sufficed to say that the 5-item Accommodation dimension was underpinned by single dimension. In addition, the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

point-measure correlations were all above .8, as shown in Figure 9 in Appendix 25, indicating that high correlations existed between individual items in the 5-item Accommodation dimension and the entire 5-item Accommodation dimension measure, and that the 5 items were oriented in the same direction as the entire measure. As indications of item discrimination, the point-biserial correlations ranged from .80 to .87 (see Figure 11 in Appendix 25), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 5-item data set.

Re-analysis of category function of Accommodation dimension with the 5 remaining items revealed that all observed counts were greater than 10, that observed averages monotonically increased across 5 categories, that all Outfit MNSQs were less than 2, and that structure calibrations advanced by between 1.4 and 5 logits (see Figure 12 in Appendix 25). All these results met Linacre's (1999) guidelines of an effective rating scale. In addition, the category probability curves of the 5-item Accommodation dimension had a distinct peak, and no peaks overlapped each other (see Figure 13 in Appendix 25). As such, the category functioning of the five-point rating scale in this 5-item Accommodation dimension worked well.

Based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.25 for the 5 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from -.3924 to .0409 (see Figure 14 in Appendix 25) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.3924) indicated that those two items only shared about 15% of the variance in their residuals in common (i.e., common variance = correlation^2); 85% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 15 in Appendix 25 shows person separation and person reliability were 1.96 and .79 respectively, whereas item separation and item reliability were 4.43 and .95 respectively. Person reliability of .79 was considered barely high because it was just marginally below the cutoff value of .8 for high reliability. Item reliability of .95 was regarded as very high since it was much above the cutoff value of .8 for high reliability and close to 1. Person separation index value, 1.96, was considered fair since it was marginally lower than the minimum value of person separation, 2. Item separation index value, 4.43, was considered very good as it was much higher than the good value of item separation, 3.

Figure 16 in Appendix 25 revealed that there seems to be good targeting for the 5-item Accommodation dimension because the mean logit measures of the participants' level of acculturative stress arising from Accommodation matters was found to have a deviation of -.69 logit from the mean of item severity measures. However, there were floor effect with about 10.6% (= 29/274) of the participants who attained minimum scores (> 5% of the total sample), and small ceiling effect with about 5.5% (= 15/274) of the participants who achieved maximum scores (> 5% of the total sample). These floor and ceiling effect represented an inadequate item to person targeting, particularly where participants with very low or very high level of acculturative stress arising from Accommodation issues were not covered by any items at the bottom or top of Figure 16 in Appendix 25. A few items with lower severity could be introduced between -4 and -5 logits and a few items with higher severity could be added between 3.5 and 5 logits. Nevertheless, there was generally wide coverage of person distribution by the item thresholds from -4 to 3.5 logits, that is, the item-difficulty range (as presented by step calibrations of the rating categories in Figure 16 in Appendix 25) had sufficient coverage for the majority of the survey participants.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Concerning the issue of item hierarchy, the construct keymap of this 5-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 17 in Appendix 25). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 5-item subdimension. In addition, the item severity hierarchy map was shown in Figure 18 in Appendix 25.

4.4.10 Finance

The eigenvalue of the first contrast of the principal components analysis of Rasch residuals was 2.3 (see Figure 1 in Appendix 26), which means that these 7 items did not constitute a unidimensional scale, having the threshold value greater than 2 eigenvalue units in the first contrast. Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 26) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 26), the Finance dimension were split into two groups: group 1 (items Q157, Q158, and Q160) and group 2 (items Q156, Q161, and Q162). In group 1, its thresholds advanced from categories 4 to 5 by less than 1.4 logits, and item Q158 had gender DIF. Moreover, its person separation and reliability were just 1.41 and .67; its item separation and reliability were zero because the items were about of the same severity (i.e., difficulty), resulting in their item severities being close together. Item separation and reliability of group 1 remained zero, even though the rating scale structure was amended from 5 to 4 categories, giving rise to its thresholds' increments being greater than 1.4 across 4 categories and item Q158 no longer having gender DIF. Therefore, group 1 (items Q157, Q158, and Q160) could not be accepted as a valid subdimension, and the composition of Finance dimension was revised to include items Q156, Q161, and Q162 of

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

group 2 only.

As indicated in Figure 4 in Appendix 26, all the 3 items in the revised Finance dimension fell within the acceptable bounds of MNSQ and ZSTD. As shown in Figure 6, the eigenvalue of the unexplained variance in the first contrast was 1.6, well below the cutoff value of 2; moreover, this 3-item Finance dimension could explain 79.3% of the raw variance. The point-measure correlations of the 3 items were all positive and above .5, ranging from .91 to .95 (see Figure 4 in Appendix 26); this demonstrated that the 3 items were oriented in the same direction as the measure. As indications of item discrimination, the point-biserial correlations ranged from .91 to .95 (see Figure 5 in Appendix 26), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 3-item data set. All these results corroborated that this 3-item subdimension was unidimensional.

Based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.5 for the 3 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.44 to -.55 (see Figure 7 in Appendix 26) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.55) indicated that those two items only shared about 30% of the variance in their residuals in common (i.e., common variance = correlation^2); 70% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Figure 8 in Appendix 26 demonstrated that the five-point rating scale met most of the Linacre's (1999) guidelines of an effective rating scale. The observed counts of all categories

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

were much greater than 10, ranging between 88 and 253; the observed averages monotonically increased from -6.86 to 5.3 across categories 1 to 5; the category Outfit MNSQ was smaller than 2. Nonetheless, thresholds (i.e., structure calibrations) did not increase monotonically by between 1.4 logits and 5 logits across categories 1 to 5. A graph of category probabilities, on the contrary, provided evidence of good category functioning that each category had a distinct peak, meaning that all categories were working fine (see Figure 9 in Appendix 26). Since Linacre's (1999) guidelines are not laws, they only suggest the situation in which the rating scale functions the best. Taken together, the category functioning results supported use of the five-point rating scale in this 3-item dimension of Finance.

As shown in Figure 10 in Appendix 26, none of the 3 items exhibited gender DIF as no DIF contrasts were greater than .64 logit. Furthermore, there was no statistically significant difference by gender in the 3 items either, since all *p* values in the Prob. column of Welch were much greater than .05.

Figure 12 in Appendix 26 revealed that there seems to be satisfactory targeting for the 3-item Finance dimension because the mean logit measures of the participants' level of acculturative stress arising from financial matters was found to have a deviation of -.91 logit from the mean of item severity measures. However, there were floor effect with about 18% (= 50/274) of the participants who attained minimum scores (> 5% of the total sample) and ceiling effect with about 7.3% (= 20/274) of the participants who achieved maximum scores (> 5% of the total sample). These floor and ceiling effects represented an inadequate item to person targeting, particularly where participants with very high or very low level of acculturative stress arising from financial matters were not covered by any additional items at

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

the top and bottom of Figure 12 in Appendix 26. More items with less severity could be added at -8 logits to address the floor effect. Also, a few items with higher severity could be added between 7 and 8 logits to cater for some participants with higher level of acculturative stress. Nevertheless, there was generally good coverage of the latent variable (i.e., acculturative stress arising from financial matters) by the item thresholds, as shown in Figure 12 in Appendix 26.

Person separation and person reliability were 2.19 and .83 respectively, whereas item separation and item reliability are 4.75 and .96 respectively (see Figure 13 in Appendix 26). Both person and item reliabilities of this 3-item Finance dimension were considered high reliability, i.e., over .8. Person separation index value, 2.19, were considered fair since it was higher than the minimum value of person separation, 2. Item separation index value, 4.75, was considered very good as it was much higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item severities (i.e., difficulties).

Concerning the issue of item hierarchy, the construct keymap of this 3-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 14 in Appendix 26). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 3-item subdimension. In addition, the item severity hierarchy map was shown in Figure 11 in Appendix 26.

4.4.11 Life Stress

The eigenvalue of the first contrast of the principal components analysis of Rasch residuals was 2.4 (see Figure 1 in Appendix 27), which means that these 10 items did not constitute a

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

unidimensional scale, having the threshold value greater than 2 eigenvalue units in the first contrast. Derived from residual loadings for items in the first contrast (see Figure 2 in Appendix 27) and clusters of items that shared variation in the principal component plot of item loadings for the first contrast (see Figure 3 in Appendix 27), the Life Stress dimension were split into 3 groups: group 1 (items Q170, Q171, and Q172), group 2 (items Q165, and Q167), and group 3 (items Q163, Q164, Q166, Q168, and Q169) for further examination.

In group 1, its thresholds advanced from categories 3 to 4 by 1.19 logits, less than 1.4 logits (see Figure 4 in Appendix 27) as well as non-distinct peak in category 3 (see Figure 5 in Appendix 27). There were 3 ways to combine the categories in group 1: combining categories 3 and 4 (Figures 6 and 7 in Appendix 27), combining categories 4 and 5 (Figures 8 and 9 in Appendix 27), and combining categories 2 and 3 (Figures 10 and 11 in Appendix 27). Among the three visual pictures, Figures 9 and 11 in Appendix 27 did not show that all category probability curves had distinct peaks. Relating to the three respective visual pictures, Figures 8 and 10 in Appendix 27 revealed that some threshold advancements were still less than 1.4 logits. Hence, ways of combining categories 4 and 5 as well as combining categories 2 and 3 were discarded. Although combining categories 3 and 4 resulted in all the probability curves having distinct peaks (see Figure 7 in Appendix 27), the observed average was not monotonically increasing across the four categories (see Figure 6 in Appendix 27). In addition, not all category Outfit MNSQs were less than 2 (see Figure 6 in Appendix 27). These results of group 2 indicated that group1 was not in compliance with Linacre's (1999) guidelines as to category functioning. Analysis of the item fitness revealed that there was a misfit item Q171 with its ZSTDs greater than 2 and Outfit MNSQ slightly lower than .6 (see Figure 12 in Appendix 27). Upon removing item Q171, person separation and reliability became zero (see Figure 13 in Appendix 27). Even though Q171 was retained, person

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

separation and reliability were only .82 and .4 respectively (see Figure 14 in Appendix 27), indicating that group 1 was not an acceptable scale. Taken together, group 1 consisting items Q170, Q171, and Q172 was discarded.

In group 2, its thresholds advanced from categories 2 to 3 by 5.61 logits, more than 5 logits (see Figure 15 in Appendix 27) as well as non-distinct peak in category 4 (see Figure 16 in Appendix 27). Redefining the category 2 as two narrower categories and collecting data for new categories was infeasible since the data collection was completed. Furthermore, the person separation and reliability were 1.18 and .58 respectively (see Figure 17 in Appendix 27), indicating that group 2 was a moderately reliable scale. Besides, targeting for group 2 was not satisfactory since the mean logit measures of the participants' level of acculturative stress in group 2 were found to have a large deviation (i.e., -1.69 logits) from the mean of item severity measures (see Figure 18 in Appendix 27). Group 2 also revealed a floor effect with about 21% (=58/274) (see Figure 18 in Appendix 27). Taken together, group 2 was not considered an effective scale and was discarded.

In group 3, its thresholds advanced from categories 3 to 4 by 1.32 logits and from categories 4 to 5 by .7 logit, less than 1.4 logits (see Figure 19 in Appendix 27) as well as non-distinct peak in categories 3 and 4 (see Figure 20 in Appendix 27). Since the issue of problematic category functioning involved both categories 3 and 4, it was natural to combine them to form a new category 3. Figure 21 in Appendix 27 shows that observed count of each category was more than 10; observed averages increased monotonically across the 4 categories; all category Outfit MNSQs were less than 2; and thresholds advanced by between 1.4 logits and 5 logits across the 4 categories. Besides, Figure 22 in Appendix 27 shows distinct peaks in all category probability curves. These results demonstrated that the new 4-

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

point rating scales of group 3 functioned well.

The principal component analysis of group 3 revealed that 53.2% of total variance was explained by group 3 and an eigenvalue of 2 was accounted for by the second major component, a borderline case of unidimensionality (see Figure 23 in Appendix 27). The item fit analysis identified item Q166 as misfitting for its absolute value of ZSTDs being a bit greater than 2 by .9 (see Figure 24 in Appendix 27). However, item Q166 was retained, rather than deleted, for the reason that deleting it from group 3 would lower scale precision since no other item with the same level of item severity existed in group 3 (Campbell, Wright, & Linacre, 2002) as indicated in the person-item map (see Figure 26 in Appendix 27). The total variance explained by group 3 would drop to 52% (from 53.2%), and the eigenvalue accounted for by the second major component would go up to 2.1 (from 2) (see Figures 23 and 25 in Appendix 27), suggesting a violation of unidimensionality. Besides, the person separation and reliability would drop to 1.29 from 1.6, and to .62 from .72 respectively (see Figures 28 and 32 in Appendix 27). The point-measure correlations of group 3 were all positive and above .5, ranging from .78 to .86 (see Figure 24 in Appendix 27); this demonstrated that the 5 items were oriented in the same direction as the measure, and high correlations existed between individual items in group 3 and the overall group 3 measure. As indications of item discrimination, the point-biserial correlations ranged from .76 to .85 (see Figure 31 in Appendix 27), which means that this small range of item discrimination should be regarded as equal enough to justify the use of Rasch model on this 5-item data set. Taken together, the results could be considered meeting requirements of unidimensionality and item fitness.

Analysis of gender DIF showed that the Welch *t* probabilities were all much greater than .05,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and absolute values of DIF contrasts were much smaller than .64, almost about zero (Figure 26 in Appendix 27). Therefore, these results provided evidence that group 3 did not have gender DIF.

Figure 27 in Appendix 27 revealed that there was not satisfactory targeting for the 5-item group 3 because the mean logit measures of the participants' level of acculturative stress arising from life stress was found to have a deviation of -1.41 logit from the mean of item severity measures. Furthermore, group 3 revealed a floor effect with about 17.5% (= 48/274) of the participants who attained minimum scores (> 5% of the total sample), whereas no *ceiling* effect with about 1.1% (= 3/274) of the participants who achieved maximum scores (< 5% of the total sample). Hence, these results represented an inadequate item to person targeting, particularly for those participants who had lower or even no acculturative stress arising from life matters and were not addressed by any group 3 items located at the bottom of Figure 27 in Appendix 27. More items with less severity could be added between –5 and -4 logits to address the floor effect. Nonetheless, there was generally good coverage of the latent variable (i.e., acculturative stress arising from life matters) by the item thresholds from -4 to 4 logits.

Person separation and person reliability were 1.6 and .72 respectively, whereas item separation and item reliability are 3.28 and .92 respectively (see Figure 28 in Appendix 27). Person reliability of .72 was considered moderate reliability, i.e., lower than .8. Item reliability of .92 was considered high reliability, i.e., over .8. Person separation index value, 1.6, was considered poor since it was lower than the minimum value of person separation, 2. Item separation index value, 3.28, was considered good as it was a bit higher than the good value of item separation, 3 that can at least divide the items into high, medium, and low item

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

severities (i.e., difficulties).

Regarding local dependence, based on the formula -1/(L – 1), where L is length of the dimension, the ideal value is approximately -.25 for the 5 items when local item independence holds. Generated from WINSTEPS, the correlations of residuals for each item pair ranged from about -.56 to .17 (see Figure 29 in Appendix 27) and were not too much deviated from the ideal value. Moreover, the highest correlation (-.56) indicated that those two items only shared about 31% of the variance in their residuals in common (i.e., common variance = correlation^2); 69% of each of their residual variances differ. Hence, there was no considerable evidence of violation of the assumption of local independence.

Concerning the issue of item hierarchy, the construct keymap of this 5-item data set reveals that the most severe items to endorse at higher categories were put at the top, whereas the items easier to endorse at higher categories were put at the bottom (see Figure 30 in Appendix 27). Since the ranking of the items makes sense, there was evidence for item hierarchy for this 5-item subdimension. In addition, the item severity hierarchy map was shown in Figure 26 in Appendix 27.

After all, the 5-item group 3 was the only valid sub-dimension under Life Stress dimension. Hence, the composition of Life Stress dimension was revised to include items Q163, Q164, Q166, Q168, and Q169 of group 3 only.

4.5 Convergent validity of 21 dimensions of the ASSMCUS

After deriving 21 dimensions from the 11 initial dimensions of ASSMCUS, the person measures in logits of its 21 dimensions, Life Satisfaction, Chinese Affect (positive), and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Chinese Affect (negative) were generated from WINSTEPS 3.71. All these person measures were put in an Excel file and then imported to IBM SPSS Statistics 24. Using "Bivariate" function in "Correlate" under the menu "Analyze" in IBM SPSS Statistics 24, the correlations between criterion measurements (i.e., Chinese Affect (negative), Chinese Affect (positive), and Life Satisfaction) and the 21 dimensions of ASSMCUS were obtained and displayed in Table 4.12. It was anticipated that each dimension of ASSMCUS would be positively correlated with Chinese Affect (negative), and negatively correlated with Life Satisfaction and Chinese Affect (positive). As such, one-tailed test was adopted.

Convergent validity is the extent to which a measure is correlated with another measure that they should theoretically be correlated to one another (e.g., Chou, Jun, & Chi, 2005; Pan, 2008). Examining convergent validity was conducted by checking the correlations with the abovementioned criterion measurements that were empirically found to be associated to acculturative stress (Pan, Yue, & Chan, 2010). As expected in Table 4.12, all the person measures of 21 dimensions were found to correlate positively with Chinese Affect (negative), and negatively with Life Satisfaction and Chinese Affect (positive). All values of these correlations, though low to moderate, were statistically significant, except that 4 of them were statistically nonsignificant. The third dimension, Cantonese Barrier: Limited Cantonese Proficiency, did not have a statistically significant correlation with Life Satisfaction and Chinese Affect (Positive); the fourth dimension, Cantonese Barrier: Limited Colloquial Cantonese, did not correlate with Chinese Affect (Positive) significantly in a statistical sense; the seventh dimension, Cultural Difference: Mutual Cultural Misunderstanding, and Life Satisfaction could not reach a statistically significant correlation. The statistical nonsignificance might be partially attributed to the highest number of participants, 70 (25.5% of 274 participants, as shown in Table 4.3), coming from Guangdong Province, who knew

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Cantonese and were quite familiar with the Chinese culture in the southern China. Another reason could be that the present sample size of 274 participants was not larger enough, as the larger the sample size, the higher statistical significance in the correlational analysis (Khalilzadeh & Tasci, 2017). Since the criterion measurements were not designed to assess the same construct (i.e., acculturative stress) as the ASSMCUS, low to moderate statistically significant correlations were still acceptable. Overall, the patterns of correlation between person measures of each dimension of the ASSMCUS and those of criterion measurements were all in the expected direction, giving evidence of acceptable convergent validity for the 21 dimensions of the ASSMCUS.

Table 4.12
Convergent validity of the 21 dimensions of the ASSMCUS

	Life Satisfaction	Chinese Affect (Positive)	Chinese Affect (Negative)
1. English Barrier: Limited English Proficiency	-.207**	-.106*	.245**
2. English Barrier: Limited Colloquial English	-.228**	-.125*	.315**
3. Cantonese Barrier: Limited Cantonese Proficiency	-0.096	-0.085	.186**
4. Cantonese Barrier: Limited Colloquial Cantonese	-.100*	-0.077	.158**
5. Study Stress: Heavy Course Load	-.233**	-.172**	.348**
6. Study Stress: Student-Centred Learning Approach	-.238**	-.215**	.353**
7. Cultural Difference: Mutual Cultural Misunderstanding	-0.097	-.176**	.286**
8. Cultural Difference: Identifying with Hong Kong's Culture and Values	-.155**	-.146**	.324**
9. Social Interaction: Loneliness	-.251**	-.295**	.333**
10. Social Interaction: Hard to Make Friends with Hong Kong People	-.220**	-.329**	.372**
11. Social Interaction: Limited Social Connectedness	-.248**	-.354**	.404**
12. Discrimination: Negative Attitudes	-.156**	-.193**	.231**
13. Discrimination: Feeling Rejected	-.196**	-.200**	.325**
14. Discrimination: Stereotypes	-.102*	-.183**	.260**
15. Family Responsibility	-.201**	-.195**	.384**
16. Homesickness	-.124*	-.125*	.345**
17. Career Prospects: Application of knowledge	-.182**	-.154**	.350**
18. Career Prospects: Where to Develop One's career	-.295**	-.250**	.417**
19. Accommodation	-.180**	-.281**	.368**
20. Finance	-.215**	-.258**	.337**
21. Life Stress	-.175**	-.262**	.378**

Note: $*p < .05$, $**p < .01$, one-tailed. N=274.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

4.5 A summary of psychometric properties of 21 dimensions of the ASSMCUS

Table 4.13

Goodness of Fit to the Rasch Model (N=274)

Dimension	No. of Items	Range of Infit MNSQ	Range of Outfit MNSQ	Range of Point-Measure Correlation	Eigenvalue of first contrast	Raw variance explained by Rasch measures, %
1. English Barrier: Limited English Proficiency	9	.73 - 1.22	.72 - 1.23	.75 - .85	1.8	66.2
2. English Barrier: Limited Colloquial English	5	.89 - 1.11	.87 - 1.11	.84 - .89	1.6	75.1
3. Cantonese Barrier: Limited Cantonese Proficiency	12	.72 - 1.18	.78 - 1.14	.84 - .91	1.8	74.4
4. Cantonese Barrier: Limited Colloquial Cantonese	4	.69 - 1.18	.69 - 1.13	.94 - .97	1.6	82.2
5. Study Stress: Heavy Course Load	6	.76 - 1.16	.73 - 1.14	.80 - .85	1.8	66.3
6. Study Stress: Student-Centred Learning Approach	3	.84 - 1.18	.83 - 1.16	.80 - .89	1.5	72.8
7. Cultural Difference: Mutual Cultural Misunderstanding	6	.77 - 1.16	.74 - 1.11	.81 - .88	1.7	69.4
8. Cultural Difference: Identifying with Hong Kong's Culture and Values	6	.88 - 1.10	.84 - 1.06	.67 - .77	1.7	56.7
9. Social Interaction: Loneliness	5	.78 - 1.14	.74 - 1.12	.85 - .90	1.6	71.6
10. Social Interaction: Hard to Make Friends with Hong Kong People	5	.85 - 1.11	.84 - 1.09	.81 - .86	1.7	59.6
11. Social Interaction: Limited Social Connectedness	11	.83 - 1.15	.83 - 1.17	.72 - .80	1.8	52.8
12. Discrimination: Negative Attitudes	7	.86 - 1.20	.86 - 1.05	.79 - .86	1.8	62.6
13. Discrimination: Feeling Rejected	4	.88 - 1.18	.86 - 1.16	.79 - .90	1.8	68.7
14. Discrimination: Stereotypes	4	.77 - 1.14	.68 - 1.08	.90 - .92	1.7	73.3
15. Family Responsibility	3	.75 - 1.27	.74 - 1.25	.89 - .94	1.7	72.0
16. Homesickness	5	.80 - 1.13	.80 - 1.08	.88 - .92	1.6	72.7
17. Career Prospects: Application of knowledge	3	.87 - 1.07	.83 -1.03	.91 - .93	1.6	73.1
18. Career Prospects: Where to Develop One's career	6	.69 - 1.18	.69 - 1.15	.87 - .92	1.7	69.3
19. Accommodation	5	.80 - 1.17	.81 - 1.19	.84 - .88	1.7	65.0
20. Finance	3	.86 - 1.08	.79 - 1.14	.91 - .95	1.6	79.3
21. Life Stress	5	.75 - 1.09	.75 - 1.07	.78 - .86	2.0	53.2

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 4.14

Category Functioning (N = 274)

Dimension	No. of Categories	Category count > 10	Monotonically increasing category average measure	Outfit category MNSQ < 2	Step difficulties advancing by between 1.4 and 5 logits	Distinct peaks of category probability curves
1. English Barrier: Limited English Proficiency	5	Yes	Yes	Yes	Yes	Yes
2. English Barrier: Limited Colloquial English	5	Yes	Yes	Yes	Yes	Yes
3. Cantonese Barrier: Limited Cantonese Proficiency	5	Yes	Yes	Yes	Yes	Yes
4. Cantonese Barrier: Limited Colloquial Cantonese	5	Yes	Yes	Yes	No	Yes
5. Study Stress: Heavy Course Load	5	Yes	Yes	Yes	Yes	Yes
6. Study Stress: Student-Centred Learning Approach	5	Yes	Yes	Yes	Yes	Yes
7. Cultural Difference: Mutual Cultural Misunderstanding	5	Yes	Yes	Yes	No	Yes
8. Cultural Difference: Identifying with Hong Kong's Culture and Values	5	Yes	Yes	Yes	No	Yes
9. Social Interaction: Loneliness	5	Yes	Yes	Yes	No	Yes
10. Social Interaction: Hard to Make Friends with Hong Kong People	4	Yes	Yes	Yes	Yes	Yes
11. Social Interaction: Limited Social Connectedness	4	Yes	Yes	Yes	Yes	Yes
12. Discrimination: Negative Attitudes	4	Yes	Yes	Yes	Yes	Yes
13. Discrimination: Feeling Rejected	5	Yes	Yes	Yes	No	Yes
14. Discrimination: Stereotypes	5	Yes	Yes	Yes	No	Yes
15. Family Responsibility	5	Yes	Yes	Yes	Yes	Yes
16. Homesickness	5	Yes	Yes	Yes	Yes	Yes
17. Career Prospects: Application of knowledge	5	Yes	Yes	Yes	Yes	Yes
18. Career Prospects: Where to Develop One's career	5	Yes	Yes	Yes	Yes	Yes
19. Accommodation	5	Yes	Yes	Yes	Yes	Yes
20. Finance	5	Yes	Yes	Yes	No	Yes
21. Life Stress	4	Yes	Yes	Yes	Yes	Yes

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 4.15

Rasch Separation and Reliability; Categories; and Cronbach's Alpha (N=274)

	Dimension	No. of Items	No. of Categories	Rasch (Non-extreme) Person Separation	Person Reliability	Item Separation	Item Reliability	Measured Person	Cronbach's Alpha	Measured (Extreme and Non-extreme) Person
1.	English Barrier: Limited English Proficiency	9	5	3.03	0.90	8.23	0.99	268	0.94	274
2.	English Barrier: Limited Colloquial English	5	5	2.80	0.89	6.62	0.98	256	0.96	274
3.	Cantonese Barrier: Limited Cantonese Proficiency	12	5	4.06	0.94	4.74	0.96	229	0.98	269
4.	Cantonese Barrier: Limited Colloquial Cantonese	4	5	2.93	0.90	5.45	0.97	182	0.97	257
5.	Study Stress: Heavy Course Load	6	5	2.41	0.85	5.36	0.97	257	0.92	274
6.	Study Stress: Student-Centred Learning Approach	3	5	1.72	0.75	8.91	0.99	239	0.88	274
7.	Cultural Difference: Mutual Cultural Misunderstanding	6	5	2.41	0.85	4.18	0.95	229	0.95	271
8.	Cultural Difference: Identifying with Hong Kong’s Culture and Values	6	5	1.78	0.76	6.70	0.98	238	0.87	273
9.	Social Interaction: Loneliness	5	5	2.37	0.85	2.99	0.90	203	0.97	266
10.	Social Interaction: Hard to Make Friends with Hong Kong People	5	4	1.94	0.79	3.35	0.92	231	0.94	270
11.	Social Interaction: Limited Social Connectedness	11	4	2.54	0.87	3.36	0.92	243	0.95	273
12.	Discrimination: Negative Attitudes	7	4	2.02	0.80	4.31	0.95	214	0.95	265
13.	Discrimination: Feeling Rejected	4	5	1.70	0.74	7.88	0.98	214	0.89	265
14.	Discrimination: Stereotypes	4	5	1.99	0.80	2.87	0.89	187	0.95	258
15.	Family Responsibility	3	5	1.90	0.78	3.67	0.93	214	0.90	272
16.	Homesickness	5	5	2.39	0.85	4.25	0.95	212	0.97	271
17.	Career Prospects: Application of knowledge	3	5	1.89	0.78	3.53	0.93	206	0.90	270
18.	Career Prospects: Where to Develop One's career	6	5	2.53	0.86	2.12	0.82	232	0.96	274
19.	Accommodation	5	5	1.96	0.79	4.43	0.95	219	0.94	263
20.	Finance	3	5	2.19	0.83	4.75	0.96	273	0.96	273
21.	Life Stress	5	4	1.60	0.72	3.28	0.92	219	0.90	271

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 4.16

Correlations of 21 dimensions of the ASSMCUS

Dimensions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	--																				
2	.879**	--																			
3	0.061	0.075	--																		
4	0.004	0.051	.905**	--																	
5	.559**	.503**	.189**	.194**	--																
6	.552**	.539**	.272**	.224**	.696**	--															
7	.257**	.301**	.331**	.315**	.445**	.420**	--														
8	.237**	.267**	.398**	.356**	.463**	.510**	.701**	--													
9	.290**	.311**	.326**	.289**	.437**	.518**	.669**	.597**	--												
10	.212**	.245**	.360**	.360**	.380**	.454**	.669**	.618**	.701**	--											
11	.272**	.296**	.352**	.303**	.416**	.487**	.720**	.706**	.812**	.820**	--										
12	.183**	.200**	.335**	.331**	.369**	.395**	.648**	.613**	.629**	.613**	.670**	--									
13	.186**	.215**	.230**	.266**	.351**	.320**	.621**	.517**	.555**	.616**	.632**	.712**	--								
14	.148*	.152*	.325**	.315**	.323**	.355**	.648**	.541**	.630**	.607**	.646**	.874**	.650**	--							
15	.293**	.295**	.200**	.243**	.538**	.480**	.498**	.483**	.512**	.543**	.546**	.456**	.497**	.458**	--						
16	.144*	.186**	.295**	.265**	.325**	.340**	.516**	.497**	.533**	.484**	.514**	.455**	.442**	.470**	.653**	--					
17	.247**	.268**	.234**	.271**	.433**	.426**	.486**	.527**	.428**	.504**	.531**	.413**	.556**	.432**	.517**	.393**	--				
18	.311**	.309**	.297**	.334**	.487**	.539**	.493**	.516**	.538**	.577**	.585**	.471**	.615**	.468**	.614**	.428**	.750**	--			
19	0.065	0.116	.306**	.310**	.277**	.341**	.452**	.445**	.509**	.531**	.552**	.527**	.541**	.461**	.416**	.476**	.475**	.506**	--		
20	.381**	.357**	.213**	.219**	.437**	.460**	.408**	.431**	.428**	.448**	.505**	.417**	.515**	.377**	.551**	.291**	.461**	.563**	.461**	--	
21	.296**	.270**	.256**	.234**	.538**	.569**	.621**	.670**	.671**	.585**	.722**	.597**	.568**	.550**	.583**	.549**	.590**	.608**	.557**	.551**	--

Note: Dimensions are as follows:

1. English Barrier: Limited English Proficiency
2. English Barrier: Limited Colloquial English
3. Cantonese Barrier: Limited Cantonese Proficiency
4. Cantonese Barrier: Limited Colloquial Cantonese
5. Study Stress: Heavy Course Load
6. Study Stress: Student-Centred Learning Approach
7. Cultural Difference: Mutual Cultural Misunderstanding
8. Cultural Difference: Identifying with Hong Kong's Culture and Values
9. Social Interaction: Loneliness
10. Social Interaction: Hard to Make Friends with Hong Kong People
11. Social Interaction: Limited Social Connectedness
12. Discrimination: Negative Attitudes
13. Discrimination: Feeling Rejected
14. Discrimination: Stereotypes
15. Family Responsibility
16. Homesickness
17. Career Prospects: Application of knowledge
18. Career Prospects: Where to Develop One's career
19. Accommodation
20. Finance
21. Life Stress

*$p < .05$, **$p < .01$, two-tailed. N=274.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

The tables 4.13 to 4.15 summarize the psychometric properties of 21 dimensions of the ASSMCUS. Further discussion on these tables were found in Section 5.2 Responses to research sub-questions in Chapter 5.

Table 4.16 shows the correlations of 21 dimensions of the ASSMCUS. Since most (198 out of 210) of the correlations were below .7, i.e., from negligible to moderate positive (Mukaka, 2012), using ACER ConQuest or other advanced software to conduct multidimensional item response analysis may not increase the measurement precision much. Moreover, the current sample size of 274 is quite small for 172 items to undergo multidimensional item response analysis because a sample of size of at least 5 times of 172 items can feasibly produce a better item-parameter estimation, as a rule of thumb. Considering these two reasons, multidimensional item response analysis is not further pursued in this study for the time being.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Chapter 5: Discussion and Conclusion

This chapter is laid out in 3 main sections. The first section discusses the 21 dimensions of the ASSMCUS. The second section addresses the research sub-questions of this project in Chapter 1. The rest of this chapter includes conclusion, limitations, and future work.

5.1 Dimensions of the ASSMCUS

This study was motivated by recent research reports (Bai, 2012; Cheung, 2013; Pan, 2008; Xie, 2009; Xu, 2015a, 2015b) on acculturation issues and scale development on acculturative stress of mainland Chinese students in Hong Kong and the United States. A need was voiced in the literature for understanding mainland Chinese students' acculturation and instituting appropriate intervention to smooth out the difficulties encountered during their sojourns in Hong Kong. Such research requires psychometrically sound measures for understanding their acculturation issues and evaluating the effectiveness of subsequent interventions being instituted. This study aimed to develop and validate a scale, entitled Acculturative Stress Scale for Mainland Chinese Undergraduate Students (ASSMCUS), for measuring acculturative stress facing mainland Chinese undergraduate students in Hong Kong.

When collecting survey data from participants, care was taken to make sure that survey instruments were appropriate for participants' sojourn experiences to achieve data quality. In this research study, the ASSMCUS was developed based on literatures on acculturation and acculturative stress measurement instruments, as well as in-depth interviews and focus group interview with mainland Chinese undergraduate students in Hong Kong. Initially, ASSMCUS was a multidimensional and comprised 11 dimensions, namely, English Barrier, Cantonese Barrier, Study Stress, Cultural Difference, Social Interaction, Discrimination, Homesickness, Career Prospects, Accommodation, Finance, and Life Stress. After Rasch

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

analysis of each dimension, the final version of ASSMCUS, which was attached in Appendices 15 and 16, consists of 21 dimensions, namely, English Barrier: Limited English Proficiency; English Barrier: Limited Colloquial English; Cantonese Barrier: Limited Cantonese Proficiency; Cantonese Barrier: Limited Colloquial Cantonese; Study Stress: Heavy Course Load; Study Stress: Student-Centred Learning Approach; Cultural Difference: Mutual Cultural Misunderstanding; Cultural Difference: Identifying with Hong Kong's Culture and Values; Social Interaction: Loneliness; Social Interaction: Hard to Make Friends with Hong Kong People; Social Interaction: Limited Social Connectedness; Discrimination: Negative Attitudes; Discrimination: Feeling Rejected; Discrimination: Stereotypes; Family Responsibility; Homesickness; Career Prospects: Application of Knowledge; Career Prospects: Where to Develop One's Career; Accommodation; Finance; and Life Stress. Results of analysis suggested that the ASSMCUS was a valid instrument within a one-parameter Rasch model framework for use with mainland Chinese students pursuing their undergraduate studies in Hong Kong. The 21 dimensions were believed to relevantly cover the wide-ranging issues of acculturative stress experienced by mainland Chinese undergraduates studying in Hong Kong.

First, language barriers are the foremost acculturation issue encountered by mainland Chinese undergraduates. On one hand, the language of teaching and learning in most of Hong Kong's tertiary institutions is English. Attending lectures, writing assignments/tests/examinations, participating in class/tutorial discussions, and doing presentations require students to have a very good command of English in most academic disciplines, except Chinese literature, Chinese history, and Chinese language. Even though mainland undergraduates need to attain an acceptable result in an approved English qualification, for example, an acceptable score in international English tests like TOEFL or IELTS, to meet the entrance requirements for

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

pursuing undergraduate studies in Hong Kong's tertiary institutions, many of them find that their English is not good enough to cope with their studies. On the other hand, in some academic programs such as Bachelor of Education (Honours) (Chinese History) and Bachelor of Education (Honours) (Chinese Language), the medium of instruction is Cantonese in Hong Kong. As a result, mainland Chinese students who do not speak Cantonese have a hard time to adjust in the beginning. Outside campus such as restaurants or supermarkets, Cantonese is the dominant language. Even though many Hong Kong people started learning Mandarin after 1997, and many new mainland Chinese immigrants settled in Hong Kong each year, it is generally difficult for many mainland undergraduate students, especially for those who do not speak Cantonese, to communicate with Hong Kong residents, many of whom still do not speak Mandarin and English. To excel in their studies, improving their English skills is utmost important for mainland Chinese undergraduate students, whereas to integrate themselves into local living environments or even into social circles with local students, at least a working knowledge of Cantonese is indispensable. Hence, mainland Chinese undergraduates need to manage two languages simultaneously. It is hard to cope with a second language, let alone two!

Second, concerning study stress, mainland Chinese undergraduates are accustomed to teacher-centred teaching and learning method on mainland China, whereas tertiary institutions in Hong Kong generally adopt the student-centred learning approach, in which students are required to do case studies, group projects, group discussions, and presentations to learn from real case settings, apply what they learn in group projects, and express their views in class. Moreover, in universities on mainland China, students are often divided into classes and dormitory cohorts according to their majors and years of admission, and each cohort is taken care of (or counselled) by a teacher with respect to their academic progress

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

and life matters. By contrast, university students in Hong Kong generally do not have a fixed cohort in class and dormitory; they are free to organize their own study timetables in terms of course-taking, especially for elective courses. Besides, mainland Chinese undergraduate students are quite concerned about their academic performance because their families spend quite a large sum of money for their studies in Hong Kong, and academic excellence is considered an honour whereas academic failure brings disgrace in Chinese culture (Zou, Anderson, & Tsey, 2013). Hence, mainland Chinese undergraduate students are more fearful of academic failure and under more stress than other students. The student-centred learning approach together with their limited English proficiency and/or Cantonese proficiency, heavy course load, autonomous and self-directed studies, and expectations from family and Chinese culture give mainland Chinese undergraduates a hard time to adjust, especially when they just arrive in Hong Kong.

Third, although Hong Kong is part of China and more than 90% of the Hong Kong population are Chinese (Race Relations Unit of the Home Affairs Department of the Government of the Hong Kong Special Administrative Region, 2018), Hong Kong is culturally different from mainland China in many aspects such as Hong Kong's Cantonese intermixed with English; western festivals and public holidays in Hong Kong; fast pace of life in Hong Kong; and the concept of democracy, human rights, freedom, and rule of law under Hong Kong capitalism. These cultural differences could be attributed to Hong Kong being a British colony for 156 years from 1841 to 1997, and the previous capitalist system and way of life before 1 July 1997 was further maintained for 50 years under the Article 5 of the Basic Law of Hong Kong. The influence of western culture, especially the British one, was deep-seated before 1997 and continued even after Hong Kong's return to China in 1997. Mainland Chinese undergraduates may feel stressed to identify with the cultural practices and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

core values of Hong Kong. On the other hand, some Hong Kong residents may not know the current mainland Chinese culture very much. In a socialist environment with recent booming economic development on mainland China, “pragmatism and eyes-on-the-prize” attitude have been prevalent nowadays (Ye, 2016). However, in a western-influenced capitalist society like Hong Kong, individual freedom and respect for human rights are fundamental values among many Hong Kong people, particularly the youth of today, who have “moved beyond pragmatism” (Ye, 2016). Perhaps this difference partly explains why mutual cultural misunderstanding exists between students in Hong Kong and those from mainland China. Another probable reason could be “two competing” superiority complexes that mainland Chinese consider themselves to “be citizens of a global economic powerhouse and a sovereign state” whereas Hong Kong people identify themselves as dwellers of a world-class city which has more cultural diversity, strong soft power, and vast international links (Ye, 2016).

Fourth, pursuing studies in a host country must leave one’s social network back home (Smith & Khawaja, 2011). Re-establishing a new social network and obtaining social support in an unfamiliar society may not be easy for many non-local students (Pan, 2008). The three dimensions, Social Interaction: Loneliness; Social Interaction: Hard to Make Friends with Hong Kong people; and Social Interaction: Limited Social Connectedness, reveal the importance of a social network and social support for mainland Chinese undergraduates in Hong Kong, as indicated in some items in Appendix 16 such as “In Hong Kong, it is hard to find a close confidant I can confide in.”, “In Hong Kong, I feel very lonely.”, “I feel helpless because I am living alone in Hong Kong.”, and “I feel stressed to have a sense of belonging to Hong Kong.”. These three dimensions echoed the review findings on acculturation experiences of non-local students made by Smith and Khawaja (2011) that feelings of

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

loneliness and/or isolation in the beginning months of their sojourns, difficulties socializing with locals, and perceptions of less social support than local students are common among non-local students.

Fifth, feelings and experiences of discrimination would hinder one's motivation to attempt acculturation and could result in poor psychological well-being and depression (Poyrazli & Lopez, 2007; Smith & Khawaja, 2011). In some earlier studies of mainland Chinese students in Hong Kong, discrimination was neither a dimension in the scale of AHSCS (Pan, Yue, & Chan, 2010) nor an adjustment factor in Cheung (2013)'s study. However, in recent articles (e.g., Vyas & Yu, 2018; Yu & Zhang, 2016), some newly arrived mainland Chinese students felt discriminated, especially outside the campus. The emerging discrimination dimensions in ASSMCUS could be attributed partly to the locals having the impression that many mainland Chinese came to Hong Kong to pillage the limited necessities and public welfare, e.g., buying baby milk powder, purchasing properties, going to public hospital places to give birth to babies, studying in government-funded universities, at the expense of the local underprivileged who had a hard time in life, e.g., paying higher prices to buy baby milk powder and to purchase properties, waiting longer for pregnancy services in public hospitals, and struggling harder for few public university places (Bok & Kao, 2013). Another reason could be the widespread anti-mainland China sentiments after the suppression of the Occupy Movement in 2014 (Vyas & Yu, 2018) and the rejection of a proposed reform for the 2016 Legislative Council election and the 2017 Hong Kong Chief Executive election by Legislative Council of Hong Kong in 2015. Moreover, low Cantonese proficiency of some mainland Chinese undergraduates or poor Mandarin skills of some locals could create communication problems and/or misunderstandings, leading to perceived discrimination of some mainland Chinese undergraduates (Yu & Zhang, 2016).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Sixth, since families of mainland Chinese undergraduates expend many resources for their studies in Hong Kong, they feel a responsibility to not let their families be disappointed by studying diligently to attain a good academic standing. Such a responsibility involves more than avoiding academic failure which is already a source of stress among Chinese international students (Liu, 2009). In addition, leaving behind their families and pursuing studies in Hong Kong renders them guilty about being unable to look after their family members. Such a guilt is a common source of stress among Chinese international students (Liu, 2009); in that respect, the dimension of Family Responsibility in ASSMCUS is in line with dimension of Guilt Toward Family in ASSCS and an item in ASSIS, “I feel guilty to leave my family and friends behind”. After all, family responsibility is related to filial piety, a highly respected virtue in Chinese culture. As filial piety is associated with stress in many cases of Chinese international students (e.g., Bourne, 1975; Tian, 2017), it makes sense that dimension of Family Responsibility is part of ASSMCUS.

Seventh, being “reactions to a number of circumstances which involve separation from familiar and loved people and places” (Archer, Ireland, Amos, Broad, & Currid, 1998, p. 205), homesickness has been reported by previous researchers to result in mental health problems, such as loneliness, depression and anxiety (e.g., Liu, 2009; Poyrazli & Lopez, 2007; Sandhu & Asrabadi, 1994). However, homesickness did not stand out as a separate factor or dimension in previous research on adaption of mainland Chinese students in Hong Kong (e.g., Cheung, 2013; Pan, Yue, & Chan, 2010; Vyas & Yu, 2018, Yu & Zhang, 2016). Most mainland Chinese undergraduates in Hong Kong are still teenagers when leaving their parents and friends to live independently to pursue studies in a distant and unfamiliar culture environment for the first time; feeling homesick is unavoidable (Peng, 2016). However, with

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

the advent of telecommunication technology, homesickness can ease off a bit (Peng, 2016).

Eighth, the literature focusing on career prospects or plans of mainland Chinese students in Hong Kong relating to acculturative stress is few. The two dimensions as to Career Prospects were derived from in-depth interviews and an item in ASSIS, “I worry about my future for not being able to decide whether to stay here or to go back”, and three articles concerning the future career intentions of mainland Chinese pre-service teachers students in Hong Kong (Cheung & Yuen, 2016), the future career plans of mainland Chinese students in Hong Kong (Yuen, Cheung, & Wong, 2017), and the mainland Chinese students’ decisions on whether to return to China after graduation in the United States (Cheung & Xu, 2015). For some academic programs that are tailored for Hong Kong’s environments such as teacher education programs and social worker education programs, the graduates do not have much transferable academic capital. Whether they can apply what they learn in Hong Kong to mainland China or other places is worrisome to them. In addition, two most obvious and worrying factors, job opportunities and difficulty in securing a job, could affect one’s decision on where to develop one’s career.

Ninth, accommodation is one of the usual and serious adjustment problems for many mainland Chinese undergraduates in Hong Kong, as reflected in the items “Finding right lodgings bothers me”, “Size of lodgings bothers me”, “Rent for lodgings bothers me”, and “Distance between campus and lodgings bothers me” in Appendix 16. The cost of rent in Hong Kong has remained the highest among the Asian cities since 2014, according to a poll conducted by ECA International (Lam, 2018). In a study on mainland professionals and students in Hong Kong conducted in 2013, accommodation topped the list of challenges / difficulties encountered in Hong Kong, with a portion of 73% of 424 responded survey

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

participants (Hong Kong Ideas Centre, 2013).   An acute shortage of hostels in Hong Kong's universities, hand in hand with high rents, forced some non-local students to rent and live in small subdivided flats (Wong, 2017). Obviously, having to live in unsatisfactory or even sub-standard accommodation for an extended period constitutes a stressful situation, increasing the risk of depression.

Tenth, Hong Kong has been one of the top five world's most expensive city in cost of living since 2016 (Li, 2018; Singh, 2017; Whitehead, 2018), according to various international survey results. Many participants expressed that the costs of living and tuitions were high in Hong Kong, as reflected in the items, "Living expenses in Hong Kong bother me" and "Tuition fee of my attending tertiary institution bothers me" in Appendix 16. Finance is still a problem for mainland Chinese undergraduates, as indicated in the item, "Studying in Hong Kong has brought me great financial pressure", probably because most of mainland Chinese undergraduate students are self-financed. Financial concern could make acculturation process stressful (Liu, 2009) and thus a negative effect on the sojourners' mental health (Kono, Eskandarieh, Obayashi, Arai, & Tamashiro, 2015). Nonetheless, with the booming economic development on mainland China in the last two decades, emerging middle class can afford their children the opportunities to pursue studies overseas (Li, 2010; Li & Bray, 2007). Nowadays, finance may not be of a much big concern when compared to 20 years ago (Cheung, 2013).

Eleventh, quality of life, as well as mental and physical health, is of concern to mainland Chinese undergraduates in Hong Kong, as revealed in items, "Arduous studies undermine my quality of life", "I am worried that intense learning may impair my physical health", "Loneliness makes me worry about my mental health" in Appendix 16. A substantial amount

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

of perceived and acculturative stress experienced by student sojourners significantly affects their health-related quality of life (Bhandari, 2012; Ogunsanya, Bamgbade, Thach, Sudhapalli, & Rascati, 2018).

The 21 dimensions of ASSMCUS are largely consistent with the previous findings on Chinese international students in Western countries and Hong Kong (Bai, 2016; Cheung, 2013; Liu, 2009; Pan, Yue, & Chan, 2010; Poyrazli & Lopez, 2007; Sandhu & Asrabadi, 1994; Smith & Khawaja, 2011; Suh et al., 2016; Vyas & Yu, 2018, Yang & Clum, 1995; Yu & Zhang, 2016). However, two Cantonese dimensions (i.e., Cantonese Barrier: Limited Cantonese Proficiency, and Cantonese Barrier: Limited Colloquial Cantonese) which did not exist in Western measures were reported in ASSMCUS, because Cantonese is a dominant and official language in Hong Kong, but not in Western world. Up to now, AHSCS is the only scale to measure acculturative hassles (or stress) in Hong Kong. When compared with AHSCS, ASSMCUS has a few more main dimensions, namely, discrimination, family responsibility, homesickness, career prospects, accommodation, finance, and life stress. Firstly, it is probably not because these dimensions were not stressors in previous studies but just because they were not one of the top 4 or 5 adaptation issues of mainland Chinese students in Hong Kong. As indicated in this study, these dimensions did have an impact on the acculturation of these student sojourners. Secondly, the sample of AHSCS was based on mainland Chinese research postgraduate students in Hong Kong. Accommodation and Financial Concern were not difficulties for them as both hostels and studentships were guaranteed to offer to them by the Hong Kong's universities. However, with limited availability of student dormitories, not all mainland Chinese undergraduates, especially those self-financed ones, were allocated a hostel room. As a result, some of them needed to pay a high rent to secure a small room to live in from the Hong Kong's expensive rental home

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

market, which led to stressful situations resulting in their depression.

5.2 Responses to research sub-questions

As Magnusson (1966) stated that “[i]n constructing an instrument for measuring psychological variables on an interval scale, — assumed that every item differentiates between individuals on one difficulty continuum, then the items must measure exactly the same trait but have different degrees of difficulty” (p. 17). The assumption means the unidimensionality underlying a scale, which is required to be ascertained in Rasch model.

On one hand, as shown in Table 4.13 in Chapter 4, all the unexplained variances in the first contrast in the 21 dimensions of ASSMCUS were less than eigenvalue of 2, except for that in life stress dimension. The eigenvalue of the unexplained variance in the first contrast in life stress dimension was 2.0, a border-line value. Nonetheless, the raw variances explained by Rasch measures in all 21 dimensions were all greater than 50%. These two vital pieces of evidence indicated that the 21 dimensions were unidimensional. In addition, the point-measure correlations being all above .5 in all 21 dimensions indicated that there were the high positive correlations of the items to the construct, and that the items functioned parallel to the construct. As a result, the 21 dimensions of ASSMCUS exhibited unidimensionality.

On the other hand, as displayed in Table 4.13 in Chapter 4, the Infit and Outfit mean square (MNSQ) statistics of the items in 21 dimensions were below 1.3 and above .65. These values of MNSQ were reasonably near 1, the expected value of the MNSQ statistics for perfect fit of items to the Rasch model (Linacre, 2012), demonstrating reasonably good fit of items to the Rasch model. Therefore, the items fit the Rasch model well.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

As shown in Table 4.14 in Chapter 4, 14 dimensions out of 21 in ASSMCUS met Linacre's (1999) guidelines on optimal category functioning of 5-point Likert rating scales. Out of these 14 dimensions, 4 dimensions had their categories combined in order to have category functioning of 4-point Likert rating scales. Although the remaining 7 dimensions out of 21 had the advance of step difficulties across categories deviated from the recommended range of 1.4 and 5 logits, the category probability curves of each dimension in ASSMCUS exhibited distinct peaks. As such, all the resulting rating scales of the 21 dimensions were considered functioning well and effectively, though 7 of them functioned sub-optimally.

Each dimension underwent gender DIF test, and had gender-DIF item removed (if any). Therefore, all the 21 final dimensions were free of gender-DIF item and maintained measurement invariance across gender group.

As indicated in Table 4.15 in Chapter 4, all the values of person separations and item separations were above 1.5 and 2 respectively, and all the values of person reliabilities and item reliabilities were above .7 and .8 respectively. Among the values of person separation, 9 of them were less than 2, but greater than 1.5. Among the values of person reliability, 8 of them were less than .8, but greater than .7. These persons results were barely acceptable since their deviations were not big. On the other hand, among the values of item separation, only 3 of them were less than 3, but still greater than 2. Among the values of item reliability, only 2 of them were less than .9, but still greater than .8. Thus, these item results were very satisfactory. Taken together, the 21 dimensions of the ASSMCUS is a promising tool for gauging acculturative stress of mainland Chinese undergraduate students in Hong Kong.

The construct keymaps and person-item maps depicted the item hierarchies of ASSMCUS's

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

dimensions. The researcher has checked that all these item hierarchies made sense. As indicated in Table 4.15 in Chapter 4, the majorities of the item separations and reliabilities were greater than 3 and .9 respectively. According to Linacre (2012, p. 644), the person sample in this study was large enough to confirm the item hierarchies of the ASSMCUS dimensions. DIF analysis also verified item hierarchies of the ASSMCUS dimensions to be fine since a consensus of the hierarchical order of items in each dimension have been reached by two groups of participants—male and female, given than no DIF items existed in the final form of ASSMCUS.

In general, the targeting between the item and person was not very satisfactory in each dimension of ASSMCUS since many dimensions had floor effects and most of the differences between means of items and of persons were greater than 1 logit. It is recommended that more items with less severity be added toward the bottom of the person-item map of each dimension of ASSMCUS to minimize the floor effect.

As mentioned in Section 4.5 of Chapter 4, the patterns of correlation between person measures of ASSMCUS's dimensions and those of criterion measurements were all in the expected direction, giving evidence of acceptable convergent validity for the 21 dimensions of ASSMCUS, although the statistically significant values of correlations were not high, and 3 dimensions did not have significant negative correlations, but negative correlations, with some criterion measurements.

In sum, all the research sub-questions in Chapter 1 were positively answered in this study, except targeting. Taken together, ASSMCUS is still a promising scale with good psychometric properties.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

5.3 Limitations

There were several limitations to this study.

5.3.1 A long questionnaire

There were 172 items for ASSMUCS, 5 items for SLS, 20 items for CAS, 4 items for concluding remarks, and 11 items for demography, making a total of 212 items. Although these items were short and straight-forward questions and were written in simplified Chinese, some respondents might get bored towards the end of the questionnaire and would pay little attention to the meaning of the items or even quit midway seeing that there were loads of questions to be answered. Long questionnaire might be one of the reasons that contributed to more than hundred negative and zero item point-measure correlations in some dimensions near the end of ASSMCUS, e.g., dimensions of Homesickness, Career, and Accommodation.

5.3.2 A moderate sample size

According Linacre (1994), 250 is the sample size of 99% confidence for definitive or high stakes item calibration. In this study, although the sample size was 274, the lengthy 212-item questionnaire stood a high chance to give rise to the aberrant behaviour of respondents. Therefore, a larger sample size is recommended, e.g., 500 is a sample size of robust confidence for adverse circumstances (Linacre, 1994).

5.3.3 Questionable sampling method

Convenient sampling method was adopted in this study. Although it is a quick way to collect data, selection bias gives rise to problems of representativeness of the sample to the population and generalizability of the findings. The true values of observed

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

measurements can be undermined by systematic, but unintended, errors (Kukull & Ganguli, 2012). To have a good range of respondents, mainland Chinese undergraduate students from different local universities were invited, for example, all eight publicly-funded universities and some private tertiary institutions in Hong Kong. The initial plan of sending the e-questionnaire through CSSAs did not work. No CSSAs responded to the request to distribute the e-questionnaire at all. Requests for sending e-questionnaire via offices/departments of local universities were also turned down. Only the academic department of the university being attended by the researcher was willing to send out group emails containing the e-questionnaire to the mainland Chinese undergraduate students once; nonetheless, their responses were not many. The alternative method of posting an advertisement containing the e-questionnaire on that university's website did not work well, either. Finally, the researcher had to rely on his visits to the local university campuses to catch hold of prospective respondents. Owing to limited time, and human and monetary resources, the sample size was not large enough to adequately represent the entire population of mainland Chinese undergraduate students in Hong Kong. Consequently, validity of ASSMCUS would be affected. To ascertain its generalizability, ASSMCUS must be further tested with other samples of mainland Chinese undergraduate students in Hong Kong in the future. Moreover, as all the data were collected online and respondents gave their responses anonymously at various times, it was not possible to gauge exactly the response rate for the entire study.

5.4 Future work

5.4.1 More tests on the ASSMCUS

This study was a preliminary testing and validation of ASSMCUS. More future

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

studies should be performed to confirm or improve its psychometric properties by taking more samples of mainland Chinese undergraduate students. This will, in turn, increase generalizability of ASSMCUS.

5.4.2 Multidimensional data analysis

As indicated in Table 4.16 in Chapter 4, most of ASSMCUS dimensions were low or moderately correlated. Using multidimensional item response approach may not increase the measurement precision much. Moreover, the current sample size of 274 is quite small. However, since ASSMCUS is a multidimensional scale, future studies may adopt multidimensional item response analysis to determine the structure and stability of the current ASSMCUS, provided that a large data set is to be collected. As the number of items is 172, the sample size should be at least 5 times of the number of items (just a rule of thumb) for better item-parameter estimation.

5.4.3 Expansion of applicability of the ASSMCUS

With this initial attempt of focusing on mainland Chinese undergraduate students, ASSMCUS could be validated with mainland Chinese postgraduate students pursuing taught-course-based programs without research components to confirm whether it is equally applicable to them, because undergraduate programs in Hong Kong are generally taught-course based without research components. Furthermore, ASSMCUS could also be examined and validated with mainland Chinese undergraduate students in Macau, Taiwan, and Singapore among different cultural groups. Future research can examine if ASSMCUS operates differently (e.g., differential item functioning) for different subgroups (e.g., coming from northern China vs southern China) of mainland Chinese undergraduate students.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

5.4.4 Addressing ceiling and flooring effects

Since some dimensions exhibit ceiling and flooring effects, some highly stressful items and/or almost unstressed items may be introduced into top and low ends of these dimensions respectively to address these effects. In addition, existing items could be checked with experts in acculturation and stress to see if sensitivities of these items could be enhanced to help address these effects.

5.5 Conclusion

Completing tertiary education in one's home country is generally not an easy task, and pursuing a university degree in a culturally different and unfamiliar place will surely add to one's difficulties. The purpose of this study was to develop a self-report scale to measure the acculturative stress of mainland Chinese undergraduate students in Hong Kong. An initial item pool was created based on literature, and then fine-tuned with in-depth and focus-group interviews to produce a 172-item questionnaire in 11 dimensions. One-parameter Rasch model analysis retained 117 items and regrouped them in 21 dimensions to give a final form of ASSMCUS, which was attached in Appendices 15 and 16. The 21 dimensions are English Barrier: Limited English Proficiency; English Barrier: Limited Colloquial English; Cantonese Barrier: Limited Cantonese Proficiency; Cantonese Barrier: Limited Colloquial Cantonese; Study Stress: Heavy Course Load; Study Stress: Student-Centred Learning Approach; Cultural Difference: Mutual Cultural Misunderstanding; Cultural Difference: Identifying with Hong Kong's Culture and Values; Social Interaction: Loneliness; Social Interaction: Hard to Make Friends with Hong Kong People; Social Interaction: Limited Social Connectedness; Discrimination: Negative Attitudes; Discrimination: Feeling Rejected; Discrimination: Stereotypes; Family Responsibility; Homesickness; Career Prospects: Application of

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Knowledge; Career Prospects: Where to Develop One's Career; Accommodation; Finance; and Life Stress.

Empirical results supported measurement validity of the ASSMCUS in terms of good Rasch item reliabilities, unidimensionality, effective response-category functioning, and absence of gender differential item functioning. Evidence of convergent validity was also reported that the ASSMCUS demonstrated a statistically significant positive correlation with negative affect, and statistically significant negative correlations with positive affect and life satisfaction. Overall, these results suggested that the ASSMCUS was a reliable and valid instrument to measure acculturative stress within a population of mainland Chinese undergraduates in Hong Kong. Moreover, the ASSMCUS was targeted at a specific place, population, language, level of studies, and cultural background, thus it was culturally appropriate to mainland Chinese undergraduates in Hong Kong. Nonetheless, it is the first Chinese scale of acculturative stress developed and validated among a sample of mainland Chinese undergraduates in Hong Kong. Further validation of the scale in the future needs to be conducted to confirm the validity of the scale. In addition, the 117-item ASSMCUS is too long, and quality of response data could be undermined because respondents may become bored or tired before they reach to the end of the ASSMCUS.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

References

Andrade, M. S. (2006). International students in English-speaking universities: Adjustment factors. *Journal of Research in International Education*, *5*(2), 131-154.

Archer, J., Ireland, J., Amos, S. L., Broad, H., & Currid, L. (1998). Derivation of a homesickness scale. *British Journal of Psychology*, *89*(2), 205-221.

A 21-year-old foreign female student committed suicide at the Chinese University of Hong Kong (2017, April 4), *WiseSearch*. Document id: 201704043409663. Retrieved from http://0-libwisesearch.wisers.net.edlis.ied.edu.hk/wortal/tool.do;jsessionid=E1DDD4D63F9080257087B24F4EF429F4.wise19?wp_dispatch=confirm-view&federated=true&doc-ids=news:162b^201704043409663(S:210969451)&menu-id=&on-what=selected&from-list&display-style=all&tooldisplay=true&currentsubdb=wisesearch

Bai, J. (2012). *Development and validation of the Acculturative Stress Scale for Chinese College Students in the United States (ASSCS)* (Doctoral dissertation, Indiana University, USA). Retrieved from https://scholarworks.iupui.edu/bitstream/handle/1805/3194/Jieru%20Bai%20Dissertation_submission%20to%20Scholarworks%208-22-2012.pdf?sequence=6&isAllowed=y

Bai, J. (2016). Development and Validation of the Acculturative Stress Scale for Chinese College Students in the United States (ASSCS). *Psychological Assessment, 28*(4), 443-447.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Beck, A., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: The Hopelessness Scale. *Journal of Consulting and Clinical Psychology, 42*(6), 861-865.

Beehr, T. A., & Franz, T. M. (1987). The current debate about the meaning of job stress. *Journal of Organizational Behavior Management*, *8*(2), 5-18.

Benson, H., & Stuart, E. I. (1992). *The wellness book: The comprehensive guide to maintaining health and treating stress related illness*. New York: Carol Publishing Group.

Berry, J. W. (1997). Immigration, acculturation, and adaptation. *Applied Psychology: An International Review*, *46*(1), 5-34.

Berry, J. W. (2003). Conceptual approaches to acculturation. In K. M. Chun, P. B. Organista & G. Marín (Eds.), *Acculturation: Advances in theory, measurement, and applied research* (pp. 17-37). Washington, DC: American Psychological Association.

Berry, J. W. (2005). Acculturation: Living successfully in two cultures. *International Journal of Intercultural Relations, 29,* 697–712.

Berry, J. W. (2006). Acculturative stress. In P. T. P. Wong & L. C. J. Wong (Eds.), *Handbook of multicultural perspectives on stress and coping* (pp. 287–298). Dallas: Springer.

Berry, J. W., Kim, U., Minde, T., & Mok, D. (1987). Comparative studies of acculturative

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

stress. *International Migration Review*, *21*(3), 491-511.

Berry, J. W., Poortinga, Y. H., Breugelmans, S. M., Chasiotis, A., & Sam, D. L. (2011). *Cross-cultural psychology: Research and applications* (3rd ed.). Cambridge, UK: Cambridge University Press.

Berry, J. W., & Sam, D. L. (1997). Acculturation and adaptation. In J. W. Berry, M. H. Segall, & C. Kagitcibasi (Eds.), *Handbook of cross-cultural psychology, Volume 3: Social behavior and applications* (pp. 291-326). Needham Heights, UK: Allyn & Bacon.

Bhandari, P. (2012). Stress and health related quality of life of Nepalese students studying in South Korea: A cross sectional study. *Health and Quality of Life Outcomes*, *10*(1), 26.

Bing Translator. http://www.bing.com/translator/?from=en&to=zh-CHS&text=

Bok, H., & Kao, E. (2013, June 23). The inbetweeners. *Post Magazine*. Retrieved from https://www.scmp.com/magazines/post-magazine/article/1264849/inbetweeners

Bond, T., & Fox, C. (2007). *Applying the Rasch model: Fundamental measurement in the human sciences* (2nd ed.). New Jersey: Erlbaum.

Boone, W. J., Staver, J. R., & Yale, M. S. (2014). *Rasch analysis in the human sciences*. Springer.

Bourne, P. G. (1975). The Chinese student—Acculturation and mental illness. *Psychiatry*,

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

38(3), 269-277.

Bowie, W. D. (1990). The effect of the Tiananmen Square Massacre upon negotiations for the Draft Basic Law of the Hong Kong Special Administrative Region. *Penn State International Law Review*, *8(2)*, 245-267.

Buckley, C., & Forsythe, M. (2015, January 16). Press freedom in Hong Kong under threat, report says. *The New York Times*. Retrieved from http://nyti.ms/1xvj9H7

Cambridge English–Chinese (Simplified) Dictionary. http://dictionary.cambridge.org/dictionary/english-chinese-simplified/

Campbell, S. K., Wright, B. D., & Linacre, J. M. (2002). Development of a functional movement scale for infants. *Journal of Applied Measurement*, *3*(2), 190-204.

Cannon, W. B. (1929). Organization for physiological homeostasis. *Physiological Reviews, 9*(3), 399-431.

Caplan, R. D. (1987). Person-environment fit theory and organizations: Commensurate dimensions, time perspectives, and mechanisms. *Journal of Vocational Behavior*, *31*(3), 248-267.

Carsten, P. (2015, January 19). China remains unlikely to loosen control over Internet, media. *The Huffington Post.* Retrieved from http://www.huffingtonpost.com/2014/11/19/china-control-internet-media-world-internet-

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

conference_n_6184250.html

Castillo, L. G., Conoley, C. W., Brossart, D. F., & Quiros, A. (2007). Construction and validation of the intragroup marginalization inventory. *Cultural Diversity and Ethnic Minority Psychology, 13*(3), 232–240.

Census and Statistics Department. (2012). *Hong Kong 2011 population census: Summary results*. Retrieved from http://www.census2011.gov.hk/pdf/summary-results.pdf

Cervantes, R. C., Fisher, D. G., Córdova, D., & Napper, L. E. (2012). The Hispanic Stress Inventory--Adolescent Version: A culturally informed psychosocial assessment. *Psychological Assessment*, *24*(1), 187-196.

Chamberlain, K., & Zika, S. (1990). The minor events approach to stress: Support for the use of daily hassles. *British Journal of Psychology*, *81*(4), 469-481.

Chandran, N. (2016, February 1). Hong Kong is world's freest economy; US slips on freedom score. *CNBC*. Retrieved from http://www.cnbc.com/2016/02/01/hong-kong-is-worlds-freest-economy-us-slips-on-freedom-rank.html

Chang, H. J., Yang, C. Y., Lin, C. R., Ku, Y. L., & Lee, M. B. (2008). Determinants of suicidal ideation in Taiwanese urban adolescents. *Journal of the Formosan Medical Association*, *107*(2), 156-164.

Chavajay, P., & Skowronek, J. (2008). Aspects of acculturation stress among international

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

students attending a university in the USA. *Psychological Reports*, *103*(3), 827-835.

Chen, A. H. Y. (2016). The law and politics of the struggle for universal suffrage in Hong Kong, 2013–15. *Asian Journal of Law and Society*, *3*(01), 189-207.

Chen, F. (2014, August 19). Life in Hong Kong for mainland graduate student. *EJInsight*. Retrieved from http://www.ejinsight.com/20140819-mainland-chinese-living-in-hong-kong-hk-china-contention/

Chen, F. (2014, December 16). HK-mainlander conflicts: Pride and prejudice. *EJInsight*. Retreived from http://www.ejinsight.com/20141216-hear-what-locals-say-about-china-hk-conflicts/

Chen, F. (2014, July 31). Why Tai Wai rental flats are looking pretty. *EJInsight*. Retrieved from http://www.ejinsight.com/20140731-mainland-chinese-students-in-hk-rent/

Chen, H. (2017). *Mainland Chinese international students and their familial responsibilities in Canada* (Master's thesis, University of Ottawa, Ottawa, Ontario, Canada). Retrieved from https://ruor.uottawa.ca/bitstream/10393/36581/3/Chen_Huimin_2017_thesis.pdf

Chen, Y. C., & Szeto, M. M. (2015). The forgotten road of progressive localism: New Preservation Movement in Hong Kong. *Inter-Asia Cultural Studies*, *16*(3), 436-453.

Cheung, A. C. (2013). Language, academic, socio-cultural and financial adjustments of mainland Chinese students studying in Hong Kong. *International Journal of Educational*

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Management, *27*(3), 221-241.

Cheung, A. C. K., & Xu, L. (2015). To return or not to return: Examining the return intentions of mainland Chinese students studying at elite universities in the United States. *Studies in Higher Education*, *40*(9), 1605-1624.

Cheung, A. C., & Yuen, T. W. (2016). Examining the motives and the future career intentions of mainland Chinese pre-service teachers in Hong Kong. *Higher Education*, *71*(2), 209-229.

Cheung, A. S. Y. (2007). Public opinion supervision: A case study of media freedom in China. *Columbia Journal of Asian Law*, *20*(2), 357-451.

Cheung, C. K., & Yue, X. D. (2013). Sustaining resilience through local connectedness among sojourn students. *Social Indicators Research, 111*(3), 785-800.

Cheung, G. W., & Chow, I. H. S. (1999). Subcultures in Greater China: A comparison of managerial values in the People's Republic of China, Hong Kong, and Taiwan. *Asia Pacific Journal of Management*, *16*(3), 369-387.

Chien, C. W., & Brown, T. (2012). Construct validity of the Children's Hand-Skills ability Questionnaire (CHSQ) in children with disabilities: A Rasch analysis. *Research in Developmental Disabilities*, *33*(4), 1242-1253.

Chui, R. C. F., & Chan, C. K. (2017). School adjustment, social support, and mental health of

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

mainland Chinese college students in Hong Kong. *Journal of College Student Development*, *58*(1), 88-100.

Chou, K. L. (2012). Perceived discrimination and depression among new migrants to Hong Kong: The moderating role of social support and neighborhood collective efficacy. *Journal of Affective Disorders*, *138*(1), 63-70.

Chou, K. L., Jun, L. W., & Chi, I. (2005). Assessing Chinese older adults' suicidal ideation: Chinese version of the geriatric suicide ideation scale. *Aging & Mental Health*, *9*(2), 167-171.

City University of Hong Kong. (2016). *Tuition fee and cost of study*. Retrieved from http://www.cityu.edu.hk/international/udgadmission_feesandcost.htm

Congressional-Executive Commission on China. (n. d.). *Judicial independence in the PRC*. Retrieved from http://www.cecc.gov/judicial-independence-in-the-prc

Conrad, K. J., Iris, M., Ridings, J. W., Langley, K., & Wilber, K. H. (2010). Self-report measure of financial exploitation of older adults. *The Gerontologist*, *50*(6), 758-773.

Constitution of the PRC, 2004. Retrieved from http://www.npc.gov.cn/englishnpc/Constitution/2007-11/15/content_1372963.htm

Cox, T. (1978). *Stress*. London: Macmillan Press.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Cox, T. (1993). *Stress research and stress management: Putting theory to work.* The United Kingdom: The Health and Safety Executive. Retrieved from http://www.hse.gov.uk/research/crr_pdf/1993/crr93061.pdf

Cox, T., & Ferguson, E. (1991). Individual differences, stress and coping. In C. L. Cooper & R. Payne. (Eds.). *Personality and stress: Individual differences in the stress process* (pp. 7-30). Chichester: Wiley.

Cox, T, & Griffiths. A. (2005). The nature and measurement of work-related stress: Theory and practice. In J. R. Wilson & N. Corlett, (Eds.), *Evaluation of human work* (3rd ed.) (pp. 553-571). Boca Raton, FL: CRC Press.

Cox, T, & Griffiths. A. (2010). Work-related stress: A theoretical perspective. In S. Leka & J. Houdmont, (Eds.), *Occupational health psychology* (pp. 31-56). John Wiley & Sons.

Cox, T. & MacKay, C. (1981). A transactional approach to occupational stress. In E. N. Corlett & J. Richardson, (Eds.), *Stress, work, design and productivity*. Chichester: Wiley & Sons.

Creswell, J. W. (2011). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* (4th ed.). Pearson.

De Benedittis, G., & Lorenzetti, A. (1992). The role of stressful life events in the persistence of primary headache: Major events vs. daily hassles. *Pain*, *51*(1), 35-42.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DeLongis, A., Coyne, J. C., Dakof, G., Folkman, S., & Lazarus, R. S. (1982). Relationship of daily hassles, uplifts, and major life events to health status. *Health Psychology*, *1*(2), 119-136.

Devonport, T. (2016). Understanding stress and coping among competitive athletes in sport: Applying psychological theory and research. In A. M. Lane (Ed.), *Sport and exercise psychology: Topics in applied psychology* (2nd ed.) (pp. 127-153). New York, NY: Routledge.

Dict.cn Dictionary. http://dict.cn/

Dict.cn Translation. http://fanyi.dict.cn/

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment*, *49*(1), 71-75.

Dimmock, C., & Ong Soon Leong, J. (2010). Studying overseas: Mainland Chinese students in Singapore. *Compare*, *40*(1), 25-42.

Edwards, J. R., Caplan, R. D., & van Harrison, R. (1998). Person-environment fit theory: conceptual foundations, empirical evidence, and directions for future research. In C. Cooper (Ed.), *Theories of organisational stress*, New York, NY: Oxford University Press, Inc.

Esarey, A. (2006). *Speak no evil: Mass media control in contemporary China*. Freedom

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

House. Retrieved from https://freedomhouse.org/sites/default/files/inline_images/Speak%20No%20Evil-%20Mass%20Media%20Control%20in%20Contemporary%20China.pdf

Espelid, K. (2014). *Judicial independence in China: A post-totalitarian story* (Master's thesis, University of Bergen, Bergen, Norway). Retrieved from https://www.jus.uio.no/smr/english/about/programmes/china/activities/norway/ma-thesis-kristian-espelid.pdf

Folkman, S. (1997). Positive psychological states and coping with severe stress. *Social Science & Medicine*, *45*(8), 1207-1221.

Folkman, S. (2008). The case for positive emotions in the stress process. *Anxiety, Stress, & Coping, 21(1)*, 3-14.

Freedom House. (2015). *Freedom of the press 2015: Hong Kong*. Retrieved from https://freedomhouse.org/report/freedom-press/2015/hong-kong

Freedom House. (2016a). *Freedom of the press 2016: Hong Kong*. Retrieved from https://freedomhouse.org/report/freedom-press/2016/hong-kong

Freedom House. (2016b). *Freedom of the press 2016: China*. Retrieved from https://freedomhouse.org/report/freedom-press/2016/china

Freedom House. (2016c). *Freedom of the press 2016.* Retrieved from

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

https://freedomhouse.org/sites/default/files/FH_FTOP_2016Report_Final_04232016.pdf

Furnham, A. (2004). Education and culture shock. *Psychologist*, *17*(1), 16.

Furnham, A., & Trezise, L. (1983). The mental health of foreign students. *Social Science & Medicine, 17*(6), 365–370.

General Adaptation Syndrome. (n. d.). In *TheFreeDictionary's Medical dictionary*. Retrieved August, 14, 2016 from http://medical-dictionary.thefreedictionary.com/general+adaptation+syndrome

Glanz, K., & Schwartz, M. D. (2008). Stress, coping, and health behaviour. In K. Glanz, B. K., Rimer, & K. Viswanath (Eds.), *Health behaviour and health education: Theory, research, and practice* (4th ed.) (pp. 211-236). San Francisco, CA: Jossey-Bass.

Goh, Y. W., Sawang, S., & Oei, T. P. (2010). The Revised Transactional Model (RTM) of occupational stress and coping: An improved process approach. *The Australian and New Zealand Journal of Organisational Psychology*, *3*, 13-20. doi:10.1375/ajop.3.1.13

Goldammer, S. (1995). International reaction to Hong Kong's countdown to 1997: Doors open to Hong Kong's emigrants. *Indiana Journal of Global Legal Studies*, *3*(1), 267-276.

Goldstein, D. S., & Kopin, I. J. (2007). Evolution of concepts of stress. *Stress*, *10*(2), 109-120.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Gomes, A. R. (2014). Positive human functioning in stress situations: An interactive proposal. In A. R. Gomes, R. Resende, & A. Albuquerque (Eds.), *Positive human functioning from a multidimensional perspective: Promoting stress adaptation* (Vol. 1, pp. 165-194). New York: Nova Science.

Goodnite, P. M. (2014). Stress: A concept analysis. *Nursing Forum*, 49(1), 71-74.

Google Translate. https://translate.google.com/#

Graves, T. (1967). Psychological acculturation in a tri-ethnic community. *South-Western Journal of Anthropology, 23,* 337-350.

Gu, M. (2011). Language choice and identity construction in peer interactions: Insights from a multilingual university in Hong Kong. *Journal of Multilingual and Multicultural development*, *32*(1), 17-31.

Guilt. (2017). In *En.OxfordDictionaries.com*. Retrieved from https://en.oxforddictionaries.com/definition/guilt

Hahn, S. E., & Smith, C. S. (1999). Daily hassles and chronic stressors: Conceptual and measurement issues. *Stress and Health*, *15*(2), 89-101.

Hamid, P. N., & Cheng, S. T. (1996). The development and validation of an index of emotional disposition and mood state: The Chinese Affect Scale. *Educational and Psychological Measurement*, *56*(6), 995-1014.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Hans Selye's General Adaptation Syndrome, classic stages of chronic stress. (n. d.). Retrieved from August 14, 2016, http://www.essenceofstressrelief.com/general-adaptation-syndrome.html

Hassard, J., & Cox, T. (2015, January 26). *Work-related stress: Nature and management.* Retrieved from September 4, 2016, https://oshwiki.eu/index.php?title=Work-related_stress:_Nature_and_management&oldid=243733

He, F. X., Lopez, V., & Leigh, M. C. (2012). Perceived acculturative stress and sense of coherence in Chinese nursing students in Australia. *Nurse Education Today*, *32*(4), 345-350.

Hoch, I. (1976). City size effects, trends and policies. *Science*, *193*(4256), 856-863.

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research, 11*(2), 213-218.

Homesickness. (2017). In *En.OxfordDictionaries.com*. Retrieved from https://en.oxforddictionaries.com/definition/homesickness

Hong Kong Ideas Centre (2013). *A study on mainland professionals and students in Hong Kong* (in Chinese). Retrieved from http://www.ideascentre.hk/wordpress/wp-content/uploads/2009/02/Mainland-Students-and-Professionals-Report.pdf

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Hong Kong Journalists Association. (2015, March 27). *Press freedom deteriorates in Hong Kong*. Retrieved from http://www.hkja.org.hk/site/portal/Site.aspx?id=A1-1330&lang=en-US

Hooke's law. (2012). *Encyclopedia Britannica*. Retrieved from http://www.britannica.com/EBchecked/topic/271336/Hookes-law

ICIBA Dictionary. http://www.iciba.com/

ICIBA Translation. http://fy.iciba.com/

IMD World Competitiveness Center. (2016). *IMD World Competitiveness Yearbook 2016*. Retrieved from http://www.imd.org/uupload/imd.website/wcc/scoreboard.pdf

Immigration Department (2015, December 11). *Immigration policy on study*. Retrieved from December 13, 2016, http://www.immd.gov.hk/eng/faq/imm-policy-study.html

Isa, N. M., & Naim, H. A. (2016). Science Process Skill Assessment: Teachers Practice and Competency. In Zhang Q. (Eds.), *Pacific Rim Objective Measurement Symposium (PROMS) 2015 Conference Proceedings* (pp. 251-266). Singapore: Springer.

Ivancevich, J. M. (1986). Life events and hassles as predictors of health symptoms, job performance, and absenteeism. *Journal of Occupational Behavior*, *7*(1), 39-51.

Ivarsson, A., Johnson, U., & Podlog, L. (2013). Psychological predictors of injury

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

occurrence: A prospective investigation of professional Swedish soccer players. *Journal of Sport Rehabilitation*, *22*(1), 19-26.

Johnson, J. V., & Hall, E. M. (1988). Job strain, workplace social support & cardiovascular disease: A cross sectional study of a random sample of the Swedish working population. *American Journal of Public Health*, *78*, 1336–1342.

Joiner Jr, T. E., & Walker, R. L. (2002). Construct validity of a measure of acculturative stress in African Americans. *Psychological Assessment*, *14*(4), 462-466.

Kalsi, P. (2013). *Exploration of the stress phenomena within public health*. (Doctoral dissertation, City University London, London, The United Kingdom). Retrieved from http://openaccess.city.ac.uk/11791/

Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine*, *4*(1), 1-39.

Kao, E., & But, J. (2013, February 5). Hong Kong ranked 14th most expensive city in world. *South China Morning Post*. Retrieved from http://www.scmp.com/news/hong-kong/article/1143346/hong-kong-ranked-14th-most-expensive-city-world

Karasek, R. (1979). Job demands, job decision latitude and mental strain: Implications for job design. *Administrative Science Quarterly*, *24*, 285–306.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Kell, P., & Vogl, G. (2012). *International students in the Asia Pacific.* Springer.

Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., *et al*. (2003). Screening for serious mental illness in the general population. *Archives of General Psychiatry*, *60*(2), 184–189. doi:10.1002/mpr.310

Khalilzadeh, J., & Tasci, A. D. (2017). Large sample size, significance level, and the effect size: Solutions to perils of using big data for academic research. *Tourism Management*, *62*, 89-96.

King, G., Pan, J., & Roberts, M. E. (2013). How censorship in China allows government criticism but silences collective expression. *American Political Science Review*, *107*(2), 326-343.

Kono, K., Eskandarieh, S., Obayashi, Y., Arai, A., & Tamashiro, H. (2015). Mental health and its associated variables among international students at a Japanese university: with special reference to their financial status. *Journal of immigrant and minority health*, *17*(6), 1654-1659.

Krueger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for applied research* (3rd ed.). Thousand Oaks: Sage.

Kubinger, K. D., Rasch, D., & Yanagida, T. (2009). On designing data-sampling for Rasch model calibrating an achievement test. *Psychology Science Quarterly, 51*(4), 370-84.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Kukull, W. A., & Ganguli, M. (2012). Generalizability The trees, the forest, and the low-hanging fruit. *Neurology*, *78*(23), 1886-1891.

Kuo, B. C. (2014). Coping, acculturation, and psychological adaptation among migrants: a theoretical and empirical review and synthesis of the literature. *Health Psychology and Behavioral Medicine: An Open Access Journal*, *2*(1), 16-33.

Kwan, K. L. K., Sodowsky, G. R., & Ihle, G. M. (1994). Worldviews of Chinese international students: An extension and new findings. *Journal of College Student Development, 35*(3), 190-197.

Kwong, Y. H. (2016a). The growth of "Localism" in Hong Kong: A new path for the democracy movement? *China Perspectives*, *3*, 63-68.

Kwong, Y. H. (2016b). State-society conflict radicalization in Hong Kong: The rise of 'anti-China' sentiment and radical localism. *Asian Affairs*, *47*(3), 428-442.

Lam, K. S. (2018, January 16). Hong Kong still the most expensive Asian city for expat executives to rent. *South China Morning Post*. Retrieved from https://www.scmp.com/print/property/hong-kong-china/article/2128526/hong-kong-still-most-expensive-asian-city-expat-executives

Lam, J., & Lum, A. (2018, August 16). Hong Kong's democrats need to focus on 'prize' of universal suffrage rather than independence, leading US academic Larry Diamond says. *South China Morning Post*. Retrieved from https://www.scmp.com/news/hong-

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

kong/politics/article/2159915/hong-kongs-democrats-need-focus-prize-universal-suffrage

Lam, O. (2016, September 24). How the pro-Beijing Sing Pao newspaper turned against CY Leung. *Hong Kong Free Press*. Retrieved from https://www.hongkongfp.com/2016/09/24/how-the-pro-beijing-sing-pao-newspaper-turned-against-cy-leung/

Lau, C. (2016, November 10). Disqualify Legco pair regardless of Beijing's ruling, Hong Kong government lawyers argue. *South China Morning Post*. http://www.scmp.com/print/news/hong-kong/politics/article/2044757/disqualify-legco-pair-regardless-beijings-ruling-hong-kong

Lawrence, S. V., & Martin, M. F. (2013). Understanding China's political system. *Congressional Research Service*. Retrieved from https://www.lsrhs.net/sites/hosfordd/files/2013/04/CRS-ChinasPolStructure-3-13.pdf

Lay, C., & Nguyen, T. (1998). The role of acculturation-related and acculturation non-specific daily hassles: Vietnamese-Canadian students and psychological distress. *Canadian Journal of Behavioural Science*, *30*(3), 172-181.

Lazarus, R. S. (1984). Puzzles in the study of daily hassles. *Journal of Behavioral Medicine, 7*(4), 375-389.

Lazarus, R. S. (1990). Theory-based stress management. *Psychological Inquiry, 1*(1), 3-13.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Lazarus, R. S. (1991a). *Emotion and adaptation*. New York, NY: Oxford University Press, Inc.

Lazarus, R. S. (1991b). Progress on a cognitive-motivational-relational theory of emotion. *American Psychologist*, *46*(8), 819-834.

Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology*, *44*, 1-21.

Lazarus, R. S. (1999). *Stress and emotion: A new synthesis*. London, England: Free Association Books.

Lazarus, R. S. (2000). How emotions influence performance in competitive sports. *The Sport Psychologist*, *14*, 229-252.

Lazarus, R. S. (2006). Emotions and interpersonal relationships: Toward a person-centered conceptualization of emotions and coping. *Journal of Personality*, *74*(1), 9-46.

Lazarus, R. S. (2012). Evolution of a model of stress, coping, and discrete emotions. In V. H. Rice (Ed.), *Handbook of stress, coping, and health: Implications for nursing research, theory, and practice* (2nd ed.) (pp. 199-225). Thousand Oaks, CA: Sage Publications, Inc.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Publishing Company.

Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality, 1*(3), 141-169. doi:10.1002/per.2410010304

Lazarus, R. S., & Folkman, S. (1986). Cognitive theories of stress and the issue of circularity. In M. H. Appley & R. A. Trumbull (Eds.), *Dynamics of stress: Physiological, psychological, and social perspectives* (pp. 63-80). New York, NY: Plenum Press. doi:10.1007/978-1-4684-5122-1

Lazarus, R. S., & Smith, C. A. (1988). Knowledge and appraisal in the cognition-emotion relationship. *Cognition & Emotion*, *2*(4), 281-300.

Le, T., & Gardner, S. K. (2010). Understanding the doctoral experience of Asian international students in the science, technology, engineering, and mathematics (STEM) fields: An exploration of one institutional context. *Journal of College Student Development, 51*(3), 252-264.

Lee, B. (2014, April 28). Problems created by mainland Chinese tourists cannot be ignored. *South China Morning Post*. Retrieved from http://www.scmp.com/comment/letters/article/1492243/problems-created-mainland-chinese-tourists-cannot-be-ignored

Lee, H. C., Chiu, H. F. K., Wing, Y. K., Leung, C. M., Kwong, P. K., & Chung, D. W. S. (1994). The Zung Self-Rating Depression Scale: Screening for depression among the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Hong Kong Chinese elderly. *Journal of Geriatric Psychiatry and Neurology*, *7*(4), 216-220.

Legislative Council Secretariat. (2014, May 7). *Research brief issue no. 6: Individual Visit Scheme.* Retrieved from http://www.legco.gov.hk/research-publications/english/1314rb06-individual-visit-scheme-20140507-e.pdf

Leong, F. T. L., & Chou, E. L. (2002). Counselling international students and sojourners. In P. B. Pedersen, J. G. Draguns, W. J. Lonner, & J. E. Trimble (Eds.), *Counselling across cultures*, (5th ed.) (pp. 185-208). Thousand Oaks, CA: Sage.

Levine, R. A., & Norenzayan, A. (1999). The pace of life in 31 countries. *Journal of Cross-Cultural Psychology, 30*(2), 178-205.

Li, C. (2010). Introduction: The rise of the middle class in the middle kingdom. In C. Li (Ed.), *China's emerging middle class: Beyond economic transformation* (pp. 3-31). Washington, DC: Brookings Institution Press.

Li, H. (2002). *College stress and psychological well-being: Vision in life as a coping resource*. (Doctoral dissertation, The University of Hong Kong, Hong Kong, China). Retrieved from http://hdl.handle.net/10722/36216

Li, M. (2006). *Cross-border higher education of Mainland Chinese Students: Hong Kong and Macao in a globalizing market* (Doctoral dissertation, The University of Hong Kong, Hong Kong, China). Retrieved from http://hub.hku.hk/handle/10722/41237

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Li, M., & Bray, M. (2007). Cross-border flows of students for higher education: Push–pull factors and motivations of mainland Chinese students in Hong Kong and Macau. *Higher education*, *53*(6), 791-818.

Li, W. (2015, March 15). Hong Kong ranks fourth in Worldwide Cost of Living report. *GBTIMES*. Retrieved from https://gbtimes.com/hong-kong-ranks-fourth-in-worldwide-cost-of-living-report

Li Wai Hung Cesario v. Administrative Appeals Board, CACV 250/2015 (2015) Retrieved from http://legalref.judiciary.gov.hk/lrs/common/ju/ju_frame.jsp?DIS=104510&ILAN=en

Lian, Y., & Tsang, K. K. (2010). The impacts of acculturation strategies and social support on the cross-cultural adaptation of mainland Chinese students in Hong Kong. *Educational Research Journal, 25*(1), 81-102.

Lin, F. (2016). *The future of judicial independence in China*. Working Paper Series No.2: May 2016. Centre for Judicial Education and Research, City University of Hong Kong. Retrieved from http://www6.cityu.edu.hk/cjer/lib/doc/paper/WK2_The_Future_of_Judicial_Independence_in_China.pdf

Lin, C. Y., Yang, S. C., Lai, W. W., Su, W. C., & Wang, J. D. (2017). Rasch models suggested the satisfactory psychometric properties of the World Health Organization Quality of

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Life—Brief among lung cancer patients. *Journal of Health Psychology*, *22(*4), 397-408.

Lin, J. C. G., & Yi, J. K. (1997). Asian international students' adjustment: Issues and program suggestions. *College Student Journal, 31*(4), 473-479.

Linacre, J. M. (1994). Sample size and item calibration stability. *Rasch Measurement Transactions*, *7*, 328. Retrieved from https://www.rasch.org/rmt/rmt74m.htm

Linacre, J. M. (1998). Structure in Rasch residuals: Why principal components analysis? *Rasch Measurement Transactions, 12*, 636.

Linacre, J. M. (1999). Investigating rating scale category utility. *Journal of Outcome Measurement*, *3*(2), 103-122.

Linacre, J. M. (2002). What do Infit and outfit, mean-square and standardized mean? *Rasch Measurement Transactions, 16*(2), 878.

Linacre, J. M. (2006). *A user's guide to Winsteps/Ministeps Rasch-model program.* Chicago, IL: MESA Press.

Linacre, J. M. (2012). *A user's guide to Winsteps/Ministeps Rasch*-model *program.* Chicago, IL: MESA Press.

Linacre, J. M. (2016). *A user's guide to Winsteps/Ministeps Rasch*-model *program.* Retrieved from http://www.winsteps.com/winman/copyright.htm

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Linacre, J. M. (2011). *Winsteps (Version 3.71.0.1) [computer software]*. Chicago: Winsteps.com.

Linguee 英中词典. http://cn.linguee.com/%E8%8B%B1%E8%AF%AD-%E4%B8%AD%E6%96%87/

Liu, M. (2009). Addressing the mental health problems of Chinese international college students in the United States. *Advances in Social Work*, *10*(1), 69-86.

Liu, Y. (2014, January 15). Empty shops on the up in Causeway Bay as high rent drives out business. *South China Morning Post.* Retrieved from http://www.scmp.com/property/hong-kong-china/article/1405572/empty-shops-causeway-bay-high-rent-drives-out-business

Lo, C. (2010, March 16). Student found hanged on campus. *South China Morning Post*, p. CITY3.

Lyon, B. L. (2012). Stress, coping, and health: A conceptual overview. In V. H. Rice (Ed.), *Handbook of stress, coping, and health: Implications for nursing research, theory, and practice* (2nd ed.) (pp. 2-20). Thousand Oaks, CA: Sage Publications, Inc.

Ma, N. (2015). The rise of "anti-China" sentiments in Hong Kong and the 2012 Legislative Council elections. *China Review*, *15*(1), 39-66.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Macnee, C. L., & McCabe, S. (2000). Microstressors and health. In V. H. Rice (Ed.), *Handbook of stress, coping, and health: Implications for nursing research, theory, and practice* (2nd ed.) (pp. 125-142). Thousand Oaks, CA: Sage Publications, Inc.

Magnusson, D. (1966). *Test Theory*. London, UK: Addison-Wesley Publishing Company.

Mak, W. W., Chen, S. X., Wong, E. C., & Zane, N. W. (2005). A psychosocial model of stress-distress relationship among Chinese Americans. *Journal of Social and Clinical Psychology*, *24*(3), 422-444.

Mark, C. K. (2007). The 'problem of people': British colonials, Cold War powers, and the Chinese refugees in Hong Kong, 1949–62. *Modern Asian Studies*, *41*(06), 1145-1181.

Mark, G. M., & Smith, A. P. (2008). Stress models: A review and suggested new direction. In J. Houdmont & S. Leka, (Eds.), *Occupational Health Psychology, European Perspectives On Research, Education and Practice* (Vol. 3) (pp. 111-144). Nottingham: Nottingham University Press.

Mason, J. W. (1971). A re-evaluation of the concept of 'non-specificity' in stress theory. *Journal of Psychiatric Research*, *8*, 323-333.

Mason, J. W. (1975). A historical view of the stress field. *Journal of Human Stress, 1*(2), 22-36.

Matsudaira, T. (2006). Measures of psychological acculturation: A review. *Transcultural*

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Psychiatry, *43*(3), 462-487.

Mazzetti, A. (2014). *Using a visual timeline method in stress research*. London, England: SAGE Publications, Ltd. doi:10.4135/978144627305013512950

McNamara, S. (2000). *Stress in young people: What's new and what can we do?* Wiltshire, UK: Continuum.

Mena, F. J., Padilla, A. M., & Maldonado, M. (1987). Acculturative stress and specific coping strategies among immigrant and later generation college students. *Hispanic Journal of Behavioral Sciences*, *9*(2), 207-225.

Mercer LLC. (2016). *2016 Cost of living rankings*. Retrieved from https://www.imercer.com/content/2016-cost-of-living-infographic.aspx

Michell, J. (2002). Stevens's theory of scales of measurement and its place in modern psychology. *Australian Journal of Psychology*, *54*(2), 99-104.

Miller, T. A., & McCool, S. F. (2003). Coping with stress in outdoor recreational settings: An application of transactional stress theory. *Leisure Sciences*, *25*(2-3), 257-275.

Miller, I. W., Norman, W. H., Bishop, S. B., & Dow, M. G. (1986). The Modified Scale for Suicidal Ideation: Reliability and validity. *Journal of Consulting and Clinical Psychology, 54*(5), 724-725.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Min, Y., & Chau, A. (2012). Social engagement in a diversifying campus: A phenomenological exploration. *Higher Education Research & Development*, *31*(2), 155-169.

Mo, P. K., Mak, W. W., & Kwan, C. S. (2006). Cultural change and Chinese immigrants' distress and help-seeking in Hong Kong. *Journal of Ethnic and Cultural Diversity in Social Work*, *15*(3-4), 129-151.

Moos, R. H., & Schaefer, J. A. (1993). Coping resources and processes: Current concepts and measures. In L. Goldberger & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects* (pp. 234-257). New York: Free Press.

Mori, S. (2000). Addressing the mental health concerns of international students. *Journal of Counseling and Development, 78*, 137-144.

Mukaka, M. M. (2012). A guide to appropriate use of correlation coefficient in medical research. *Malawi Medical Journal*, *24*(3), 69-71.

NAVER Korean Translator. http://translate.naver.com/#/en/zh-CN

Ng, J., & Yeung, R. (2016, November 9). Hundreds of Hong Kong lawyers in silent march against Beijing oath ruling. *South China Morning Post*. Retrieved from http://www.scmp.com.ezproxy.ied.edu.hk/news/hong-kong/politics/article/2043733/any-change-oversight-oath-taking-hong-kong-lawmakers-likely

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Nicholls, A. R., Perry, J. L., & Calmeiro, L. (2014). Precompetitive achievement goals, stress appraisals, emotions, and coping among athletes. *Journal of Sport & Exercise Psychology, 36*(5), 433-45.

Nikolaou, I., & Tsaousis, I. (2002). Emotional intelligence in the workplace: Exploring its effects on occupational stress and organizational commitment. *The International Journal of Organizational Analysis*, *10*(4), 327-342.

Ogunsanya, M. E., Bamgbade, B. A., Thach, A. V., Sudhapalli, P., & Rascati, K. L. (2018). Determinants of health-related quality of life in international graduate students. *Currents in Pharmacy Teaching and Learning*, *10*(4), 413-422.

Pan, J. Y. (2008). *Acculturation and resilience of mainland Chinese postgraduate students in Hong Kong* (Doctoral dissertation, The University of Hong Kong, Hong Kong, China). Retrieved from http://hub.hku.hk/bitstream/10722/52610/3/FullText.pdf?accept=1

Pan, J. Y., & Wong, D. F. K. (2011). Acculturative stressors and acculturative strategies as predictors of negative affect among Chinese international students in Australia and Hong Kong: A cross-cultural comparative study. *Academic Psychiatry, 35*(6), 376-381.

Pan, J. Y., Wong, D. F. K., Joubert, L., & Chan, C. L. W. (2008). The protective function of meaning of life on life satisfaction among Chinese students in Australia and Hong Kong: A cross-cultural comparative study. *Journal of American College Health*, *57*(2), 221-232.

Pan, J. Y., Yue, X. D., & Chan, C. L. W. (2010). Development and validation of the

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Acculturative Hassles Scale for Chinese Students (AHSCS): An example of Mainland Chinese university students in Hong Kong. *Psychologia, 53*(3), 163-178.

Peng, Y. (2016). Student migration and polymedia: Mainland Chinese students' communication media use in Hong Kong. *Journal of Ethnic and Migration Studies,* 1-18.

Poyrazli, S., Arbona, C., Nora, A., McPherson, R., & Pisecco, S. (2002). Relation between assertiveness, academic self-efficacy and psychological adjustment among international graduate students. *Journal of College Student Development, 43*, 632-642.

Poyrazli, S., & Lopez, M. D. (2007). An exploratory study of perceived discrimination and homesickness: A comparison of international students and American students. *The Journal of Psychology*, *141*(3), 263-280.

Poyrazli, S., Thukral, R. K., & Duru, E. (2010). International students race-ethnicity, personality and acculturative stress. *International Journal of Psychology and Counselling*, *2*(2), 25-32.

Prendergast, G. P., Lam, H. S., & Ki, Y. P. (2016). Local residents' perceptions of an influx of tourists: A Hong Kong case study. *Journal of International Consumer Marketing, 28*(4), 283-293.

Race Relations Unit of the Home Affairs Department of the Government of the Hong Kong Special Administrative Region (2018). *Information Centre: The Demographics: Ethnic Groups*. Retrieved from https://www.had.gov.hk/rru/english/info/info_dem.html

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Raykov, T., & Marcoulides, G. A. (2011). *Introduction to Psychometric Theory*. New York, NY: Routledge.

Radloff, L. S. (1977). The Center for Epidemiologic Studies Depression Scale (CES–D) for research in the general population. *Applied Psychological Measurements, 1,* 385–401.

Rebesco, A. P. (2011). *Constructing a measure of relational aggression using Rasch analysis: The Young Adult Conflict Resolution and Aggression Questionnaire* (Master's thesis, The University of Toledo, Ohio). Retrieved from http://utdr.utoledo.edu/cgi/viewcontent.cgi?article=1715&context=theses-dissertations

Redfield, R., Linton, R., & Herskovits, M. J. (1936). Memorandum for the study of acculturation. *American Anthropologist*, *38*, 149–152.

Reise, S. P. (1990). A comparison of item-and person-fit methods of assessing model-data fit in IRT. *Applied Psychological Measurement*, *14*(2), 127-137.

Rost, J., & von Davier, M. (1994). A conditional item-fit index for Rasch models. *Applied Psychological Measurement*, *18*(2), 171-182.

Reporters without borders. (2016). *2016 World Press Freedom Index*. Retrieved from https://rsf.org/en/ranking

Reverso Translation. http://www.reverso.net/text_translation.aspx?lang=EN

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Rew, L. (2005). *Adolescent health: A multidisciplinary approach to theory, research, and intervention*. Thousand Oaks, CA: Sage Publications, Inc. doi: http://dx.doi.org/10.4135/9781452233550

Rosenthal, D. A., Russell, V. J., & Thomson, G. D. (2006). *A growing experience*: *The health and well-being of international students at the University of Melbourne.* Melbourne, Australia: University of Melbourne. Retrieved from http://services.unimelb.edu.au/__data/assets/pdf_file/0011/358436/GrowingExperience.pdf

Rowlison, R. T., & Felner, R. D. (1988). Major life events, hassles, and adaptation in adolescence: Confounding in the conceptualization and measurement of life stress and adjustment revisited. *Journal of Personality and Social Psychology*, *55*(3), 432-444.

Ruffin, C. L. (1993). Stress and health—Little hassles vs. major life events. *Australian Psychologist, 28*(3), 201-208.

Ryan, D., Dooley, B., & Benson, C. (2008). Theoretical perspectives on post-migration adaptation and psychological well-being among refugees: Towards a resource-based model. *Journal of Refugee Studies*, *21*(1), 1-18.

Sachs, J. (2003). Validation of the satisfaction with life scale in a sample of Hong Kong university students. *Psychologia, 46*(4), 225—234.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Sam, D. L. (2001). Satisfaction with life among international students: An exploratory study. *Social Indicators Research*, *53*(3), 315-337.

Sandhu, D. S., & Asrabadi, B. R. (1994). Development of an acculturative stress scale for international students: Preliminary findings. *Psychological Reports*, *75*(1), 435-448.

Sandhu, D. S., & Asrabadi, B. R. (1998). An acculturative stress scale for international students: A practical approach to stress measurement. In C. P. Zalaquett & R. J. Wood (Eds.), *Evaluating stress: A book of resources* (Vol. 2, pp. 1–33). Lanham, MD: Scarecrow Press.

Sandhu, D. S., Portes, P. R., & McPhee, S. A. (1996). Assessing cultural adaptation: Psychometric properties of the cultural adaptation pain scale. *Journal of Multicultural Counseling and Development*, *24*(1), 15-25.

Sarason, I., Johnson, J., & Siegel, J. (1978). Assessing the impact of life changes: Development of the Life Experiences Survey, *Journal of Consulting and Clinical Psychology, 46*(5), 932-946.

Sawir, E., Marginson, S., Deumert, A., Nyland, C., & Ramia, G. (2008). Loneliness and international students: An Australian study. *Journal of Studies in International Education*, *12*(2), 148-180.

Schlebusch, L. (2004). The development of a stress symptom checklist. *South African Journal of Psychology*, *34*(3), 327-349.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Schneider, I. E., & Hammitt, W. E. (1995). Visitor response to outdoor recreation conflict: A conceptual approach. *Leisure sciences*, *17*(3), 223-234.

Searle, W., & Ward, C. (1990). The prediction of psychological and sociocultural adjustment during cross-cultural transitions. *International Journal of Intercultural Relations*, *14*(4), 449-464.

Selye, H. (1936). A syndrome produced by diverse nocuous agents. *Nature*, *138*, 32.

Selye, H. (1946). The general adaptation syndrome and the diseases of adaptation. *The Journal of Clinical Endocrinology*, *6*(2), 117-230.

Selye, H. (1976). *The stress of life.* New York: McGraw-Hill.

Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology*, *1*(1), 27-41.

Singh, H. (2017, March 20). Singapore, Hong Kong ranked world's most expensive cities in cost of living survey. *South China Morning Post*. Retrieved from https://www.scmp.com/news/hong-kong/economy/article/2080474/hong-kong-motorists-driven-despair-most-expensive-petrol

Smith, C. A., & Lazarus, R. S. (1993). Appraisal components, core relational themes, and the emotions. *Cognition & Emotion*, *7*(3-4), 233-269.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Smith, R. A., & Khawaja, N. G. (2011). A review of the acculturation experiences of international students. *International Journal of Intercultural Relations*, *35*(6), 699-713.

Smith, W. K. (1987). The stress analogy. *Schizophrenia Bulletin*, *13*(2), 215-220.

So, L. (2010, April 16). Reach out to foreign students. *South China Morning Post*, p. EDT14.

Sodowsky, G. R., & Plake, B. S. (1992). A study of acculturation differences among international people and suggestions for sensitivity to within-group differences. *Journal of Counseling & Development*, *71*(1), 53-59.

Solomon, Z., Mikulincer, M., & Hobfoll, S. E. (1987). Objective versus subjective measurement of stress and social support: Combat-related reactions. *Journal of Consulting and Clinical Psychology, 55*(4), 577-583. doi:10.1037/0022-006X.55.4.577

Somerfield, M. R. (1997). The utility of systems models of stress and coping for applied research: The case of cancer adaptation. *Journal of Health Psychology*, *2*(2), 133-151.

Sommerville, J., & Langford, V. (1994). Multivariate influences on the people side of projects: stress and conflict. *International Journal of Project Management*, *12*(4), 234-243.

Steele, K. D. (2008). *Perceptions of Chinese international students in Singapore: Adjustment issues and support* (Doctoral dissertation, University of Toronto, Toronto, Canada).

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Retrieved from https://tspace.library.utoronto.ca/handle/1807/17326

Stevens, S. S. (1946). On the theory of scales of measurement. *Science, 103*(2684), 677-680.

Stallman, H. M., & Hurst, C. P. (2011). Factor structure of the Frost Multidimensional Perfectionism Scale in university students. *Australian Psychologist*, *46*(4), 229–236. doi:10.1111/j.1742-9544.2010.00010.x

Stefanek, E., Strohmeier, D., Fandrem, H., & Spiel, C. (2012). Depressive symptoms in native and immigrant adolescents: The role of critical life events and daily hassles. *Anxiety, Stress & Coping*, *25*(2), 201-217.

Suh, H., Rice, K. G., Choi, C. C., van Nuenen, M., Zhang, Y., Morero, Y., & Anderson, D. (2016). Measuring acculturative stress with the SAFE: Evidence for longitudinal measurement invariance and associations with life satisfaction. *Personality and Individual Differences*, *89*, 217-222.

Systranet Translator. http://www.systranet.com/translate

The Basic Law of the Hong Kong Special Administrative Region of the People's Republic of China. Retrieved from http://www.basiclaw.gov.hk/en/index/index.html

The Economist Intelligence Unit Limited. (2016). *Worldwide cost of living 2016*. Retrieved from http://pages.eiu.com/rs/783-XMC-194/images/EIU_WCOL2016_FreeReport_FINAL_NEW.pdf?mkt_tok=3RkMMJWWfF

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

9wsRovuK7AZKXonjHpfsX56%2B8vXqW2lMI%2F0ER3fOvrPUfGjI4JTsthI%2BSLDwEYGJlv6SgFTbjGMbht2bgMUhU%3D

The Heritage Foundation (2016). *2016 index of economic freedom*. Retrieved from http://www.heritage.org/index/ranking

Thomas, T. N. (1995). Acculturative stress in the adjustment of immigrant families. *Journal of Social Distress and the Homeless*, *4*(2), 131-142.

Tian, Z. (2017, December 23). The filial child – A reflection on stress of Chinese students studying overseas. *IR Insider*. Retrieved from https://www.irinsider.org/east-asia-1/2017/12/23/the-filial-childa-reflection-on-stress-of-chinese-students-studying-overseas?rq=filial

Tiezzi, S. (2016, February 20). Xi wants Chinese media to be ‘publicity fronts’ for the CCP. *The Diplomat.* Retrieved from http://thediplomat.com/2016/02/xi-wants-chinese-media-to-be-publicity-fronts-for-the-ccp/

To, F. J. (2012, March 4). Mexican PhD student studying at Hong Kong Polytechnic University jumps to his death on a road from a commercial building. *Hong Kong Wen Wei Po*, p.A20. (translated from 杜法祖 (2012, March 4) 理大墨籍博士生跳商廈墮斃馬路。 *香港文匯報*, A20頁。)

Tong, R. (2016, November 8). NPC interpretation adds nothing new to Hong Kong law, and is wholly unnecessary. *South China Morning Post*. Retrieved from

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

http://www.scmp.com.ezproxy.ied.edu.hk/print/comment/insight-opinion/article/2043955/npc-interpretation-adds-nothing-new-hong-kong-law-and-wholly

Tourism Commission. (2016, August 29). Visitor information: Individual Visit Scheme. Retrieved from December 29, 2016, http://www.tourism.gov.hk/english/visitors/visitors_ind.html

Tsai, K. (2010). How to create international law: The case of Internet freedom in China. *Duke Journal of Comparative & International Law*, *21*, 401-430.

Tsang, E., & Lo, C. (2016, November 8). 2,000 Hong Kong police ready round the clock as protests over Beijing's ruling on Basic Law loom. *South China Morning Post*. Retrieved from http://www.scmp.com/print/news/hong-kong/politics/article/2043655/2000-hong-kong-police-ready-round-clock-protests-over?_=1478533138282

Un, P. (2016, November 8). HK lost autonomous power: Pan-Dems. *The Standard*. Retrieved from http://www.thestandard.com.hk/section-news.php?id=176027

UNESCO, 1971. *Statistics of students abroad, 1962-68: Where they go, where they come from, what they study.* Paris: UNESCO.

University Grant Committee. (n. d.). *Retrieve statistical table in pdf.* http://cdcf.ugc.edu.hk/cdcf/searchStatSiteReport.do

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Uphill, M. A., & Jones, M. V. (2007). Antecedents of emotions in elite athletes: A cognitive motivational relational theory perspective. *Research Quarterly for Exercise and Sport*, *78*(1), 79–89.

Vinokurov, A., Trickett, E. J., & Birman, D. (2002). Acculturative hassles and immigrant adolescents: A life-domain assessment for Soviet Jewish refugees. *The Journal of Social Psychology*, *142*(4), 425-445.

Vyas, L., & Yu, B. (2018). An investigation into the academic acculturation experiences of Mainland Chinese students in Hong Kong. *Higher Education*, 1-19.

Wadsworth, B. C., Hecht, M. L., & Jung, E. (2008). The role of identity gaps, discrimination, and acculturation in international students' educational satisfaction in American classrooms. *Communication Education, 57*(1), 64-87.

Wang, T., & Shan, X. (2006). A qualitative study on Chinese postgraduate students' learning experiences in Australia. Paper presented at the Australian Association for Research in Education Annual Conference 2006, Adelaide, Australia. Retrieved from http://www.aare.edu.au/data/publications/2006/wan06121.pdf

Wang, W. C. (2000). Modeling effects of differential item functioning in polytomous items. *Journal of Applied Measurement, 1*, 63-82.

Ward, C., Bochner, S., & Furnham, A. (2005). *The psychology of culture shock*. Routledge.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Ward, C., & Kennedy, A. (1992). Locus of control, mood disturbance, and social difficulty during cross-cultural transitions. *International Journal of Intercultural Relations*, *16*(2), 175-194.

Ward, C., & Rana-Deuba, A. (1999). Acculturation and adaptation revisited. *Journal of Cross-cultural Psychology*, *30*(4), 422-442.

Ward-bailey, J. (2014, December 29). Gmail gets burned by China's 'Great Firewall'. *The Christian Science Monitor*. Retrieved from http://www.csmonitor.com/Technology/2014/1229/Gmail-gets-burned-by-China-s-Great-Firewall

Wei, M., Heppner, P. P., Mallen, M. J., Ku, T. Y., Liao, K. Y. H., & Wu, T. F. (2007). Acculturative stress, perfectionism, years in the United States, and Depression among Chinese international students. *Journal of Counseling Psychology*, *54*(4), 385-394.

Wei, S. (2015, February 13). Inside the firewall: Tracking the news that China blocks. *ProPublica*. Retrieved from https://projects.propublica.org/firewall/

Weinberger, M., Hiner, S. L., & Tierney, W. M. (1987). In support of hassles as a measure of stress in predicting health outcomes. *Journal of Behavioural Medicine, 10*(1), 19–31.

Whitehead, J. (2018, June 26). Hong Kong tops list of most expensive cities for expatriates. *Independent*. Retrieved from https://www.independent.co.uk/travel/news-and-advice/expatriates-living-costs-survey-hong-kong-london-tokyo-zurich-a8415716.html

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Williams, C. L., & Berry, J. W. (1991). Primary prevention of acculturative stress among refugees: Application of psychological theory and practice. *American Psychologist*, *46*(6), 632–641.

Wincott, J. (1986). *Self-uncertainty and work-related stress: A personal construct investigation of the Type A and Type B behaviour pattern*. (Doctoral dissertation, The University of Hong Kong, Hong Kong, China). Retrieved from http://hub.hku.hk/bitstream/10722/34513/1/FullText.pdf?accept=1

Wong, B. S. K. (2017, October 15). Non-local students in subdivided flats highlight Hong Kong's university hostel shortage. *South China Morning Post*. Retrieved from https://www.scmp.com/news/hong-kong/community/article/2115344/non-local-students-subdivided-flats-highlight-hong-kongs

Wong Chi Fung v. Secretary for Justice, HCAL 198/2015 (2015) Retrieved from http://legalref.judiciary.gov.hk/lrs/common/search/search_result_detail_frame.jsp?DIS=104607&QS=%2B&TP=JU&ILAN=en

Wong, E. (2013, July 19). Survey in China shows a wide gap in income. *The New York Times*. Retrieved from http://www.nytimes.com/2013/07/20/world/asia/survey-in-china-shows-wide-income-gap.html?_r=1

Woo, M. Y. (1991). Adjudication Supervision and Judicial Independence in the PRC. *The American Journal of Comparative Law*, 95-119.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Wright, B. D. (1996). Comparing Rasch measurement and factor analysis. *Structural Equation Modeling: A Multidisciplinary Journal*, *3*(1), 3-24.

Wright, B. D., Linacre, J. M., Gustafson, J. E., & Martin-Lof, P. (1994). Reasonable mean-square fit values. *Rasch measurement transactions*, *8*(3), 370.

Wright, B. D., & Master, G. N. (1982). *Rating scale analysis.* Chicago, IL: Mesa Press.

Wu, E. K., & Mak, W. W. (2011). Acculturation process and distress: Mediating roles of sociocultural adaptation and acculturative stress. *The Counseling Psychologist*, *40*(1), 66-92.

Wu, N. (2014, June 24). Top student who quit HKU scholarship attains top gaokao marks for second straight year. *South China Morning Post*. Retrieved from http://www.scmp.com/news/china/article/1539597/top-student-who-quit-hku-scholarship-attains-top-marks-second-year

Wu, P. C., & Chang, L. (2008). Psychometric Properties of the Chinese Version of the Beck Depression Inventory-II Using the Rasch Model. *Measurement and Evaluation in Counseling and Development*, *41*(1), 13-31.

Wu, W. L. (2006). *A comparative analysis of the phonetics of Hong Kong Cantonese and Guangzhou Cantonese* (Master's thesis, The University of Hong Kong, Hong Kong, China). Retrieved from http://hub.hku.hk/bitstream/10722/41298/6/FullText.pdf

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Xie, C. X. Y. (2009). *Mainland Chinese students' adjustment to studying and living in Hong Kong* (Doctoral dissertation, University of Leicester, Leicester, the United Kingdom). Retrieved from https://lra.le.ac.uk/handle/2381/7978

Xu, B. (2015, April 7). Media censorship in China. *Council on Foreign Relations*.

Xu, C. L. L. (2015a). Identity and cross-border student mobility: The mainland China–Hong Kong experience. *European Educational Research Journal, 14*(1), 65-73.

Xu, C. L. L. (2015b). When the Hong Kong dream meets the anti-mainlandisation discourse: Mainland Chinese students in Hong Kong. *Journal of Current Chinese Affairs*, *44*(3), 15-47.

Yahoo!字典. https://hk.dictionary.yahoo.com/

Yan, Z., & Mok, M. M. C. (2012). Validating the coping scale for Chinese athletes using multidimensional Rasch analysis. *Psychology of Sport and Exercise*, *13*(3), 271-279.

Yang, B., & Clum, G. A. (1995). Measures of life stress and social support specific to an Asian student population. *Journal of Psychopathology and Behavioral Assessment*, *17*(1), 51-67.

Yang, J. (2013, May 29). Why living in Hong Kong as mainland Chinese is no piece of cake. *South China Morning Post*. Retrieved from http://www.scmp.com/comment/insight-opinion/article/1242671/living-hong-kong-mainlander-no-piece-cake

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Ye, J. (2016, November 12). Hong Kong residents, mainland people have similarities – and also big differences. *South China Morning Post*. Retrieved from http://www.scmp.com/news/hong-kong/education-community/article/2045245/hong-kong-residents-mainland-people-have

Yeh, C. J., & Inose, M. (2003). International students' reported English fluency, social support satisfaction, and social connectedness as predictors of acculturative stress. *Counselling Psychology Quarterly*, *16*(1), 15-28.

Yep, R. (2012). 'Cultural revolution in Hong Kong': Emergency powers, administration of justice and the turbulent year of 1967. *Modern Asian Studies*, *46*(04), 1007-1032.

Yin, S. (2013). The economic impact of Chinese international students in the United States. *Yale Economic Review*. Retrieved from http://www.yaleeconomicreview.org/archives/294

Ying, Y. W. (2005). Variation in acculturative stressors over time: A study of Taiwanese students in the United States. *International Journal of Intercultural Relations*, *29*(1), 59-71.

Yu, B., & Zhang, K. (2016). 'It's more foreign than a foreign country': Adaptation and experience of Mainland Chinese students in Hong Kong. *Tertiary Education and Management*, 1-16.

Yuan, W. (2011). Academic and cultural experiences of Chinese students at an American

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

university: A qualitative study. *Intercultural Communication Studies, 20*(1), 141-157.

Yuen, T. W. W., Cheung, A. C. K., & Wong, P. M. (2017). Studying where the jobs are: Mainland Chinese students in Hong Kong. *Asian Education and Development Studies*, *6*(3), 290-302. doi: 10.1108/AEDS-07-2016-0055

Zeng, M. (2006). *The adaptation of Mainland Chinese research postgraduates to the Universities of Hong Kong* (Doctoral dissertation, The University of Hong Kong, Hong Kong, China). Retrieved from http://hub.hku.hk/bitstream/10722/51082/6/FullText.pdf

Zeng, M., & Watkins, D. (2011). Adaptation of mainland postgraduate students to Hong Kong's universities. In D. W. Chapman, W. K. Cummings & G. A. Postiglione (Eds.). *Crossing borders in East Asia higher education* (pp. 343-373). Netherlands: Springer Netherlands.

Zhai, K. (2014, July 10). China moves to gives court judges more independence in bold reform move. *South China Morning Post*. Retrieved from http://www.scmp.com/print/news/china/article/1550694/move-more-independent-courts

Zhang, L. (2013). China's Traditional Cultural Values and National Identity. *Window into China series.* Carnegie-Tsinghua Center for Global Policy. Retrieved from http://carnegietsinghua.org/2013/11/21/china-s-traditional-cultural-values-and-national-identity-pub-53613

Zhao, S. (2015, June 3). Mainland Chinese immigrants to Hong Kong risk living 'in own

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

little worlds', researcher says. *South China Morning Post*. Retrieved from http://www.scmp.com/print/news/hong-kong/education-community/article/1814822/mainland-chinese-immigrants-hong-kong-risk-living

Zhao, Y. (2004). The state, the market, and media control in China. In P. N. Thomas & Z. Nain (Eds.), *Who owns the media?: Global trends and local resistances* (pp. 179-212). Penang, Malaysia: Southbound Sdn. Bhd.

Zhou, L., Almutairi, A. R., Alsaid, N. S., Warholak, T. L., & Cooley, J. (2017). Establishing the Validity and Reliability Evidence of Preceptor Assessment of Student Tool. *American Journal of Pharmaceutical Education*, *81*(8), 5908.

Zhou, Y., Christopher, F., & Bang, H. (2011). Understanding of international graduate students' academic adaptation to a U.S. graduate school. *International Education, 41*(1), 76-94.

Zou, W., Anderson, N., & Tsey, K. (2013). Middle-class Chinese parental expectations for their children's education. *Procedia: Social and Behavioral Sciences*, *106*, 1840-1849.

Zung, W. W. (1965). A self-rating depression scale. *Archives of General Psychiatry*, *12*(1), 63-70.

Z/Yen Group Limited. (2016). *The Global Financial Centres Index nineteenth edition*. Retrieved from http://www.longfinance.net/global-financial-centre-index-19/976-gfci-19-the-overall-rankings.html

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

棄港大重讀 遼才女兩膺狀元衝北大. (2014, June 25). *Skypost*. Retrieved from http://skypost.ulifestyle.com.hk/article/1695442/%E6%A3%84%E6%B8%AF%E5%A4%A7%E9%87%8D%E8%AE%80%20%E9%81%BC%E6%89%8D%E5%A5%B3%E5%85%A9%E8%86%BA%E7%8B%80%E5%85%83%E8%A1%9D%E5%8C%97%E5%A4%A7

城大內地交換生墮樓亡. (2014, November 14). *WiseSearch*. Document id: 201411130040127. Retrieved from http://libwisesearch.wisers.net.ezproxy.eduhk.hk/wortal/tool.do;jsessionid=31A0A4301D0D072E6EF8955993462057.wise22?wp_dispatch=confirm-view&federated=true&doc-ids=news:2792^201411130040127(S:213047932)&menu-id=&on-what=selected&from-list&display-style=all&tooldisplay=true&currentsubdb=wisesearch

疑不堪感情與學業打擊 21 歲港大內地女生跳樓輕生. (2015, November 28). *WiseSearch*. Document id: 201511283697620. Retrieved from http://libwisesearch.wisers.net.ezproxy.eduhk.hk/wortal/tool.do;jsessionid=AF0101D0D10845C6592130CB558178EE.wise18?wp_dispatch=confirm-view&federated=true&doc-ids=news:22j2^201511283697620(S:213053595)&menu-id=&on-what=selected&from-list&display-style=all&tooldisplay=true&currentsubdb=wisesearch

知多一點點 2. (2015, November 9). *港漂 – 一個美化內地生在港生活的名字* [Online Video]. Retrieved from https://www.youtube.com/watch?v=hWghqxCbgiU

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

眾新聞記者. (2018, January 15). *內地生思考香港:「Hong Kong is not China,我可以認同嗎?」*. 眾新聞. Retrieved from https://www.hkcnews.com/article/9229/%E6%B8%AF%E6%BC%82-%E4%B8%AD%E6%B8%AF%E7%9F%9B%E7%9B%BE-hong_kong_is_n

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 1: A systematic search for studies on mainland Chinese students in Hong Kong

ProQuest

Databases used:

ABI/INFORM Collection, Australian Education Index, Education Database, ERIC, PAIS Index, Physical Education Index, PILOTS, Research Library, Social Services Abstracts, Sociological Abstracts

Key terms used in the search command:

("international student" OR "non-local student" OR "student from mainland China" OR "mainland Chinese student" OR "Chinese student" OR "Chinese university student") AND "Hong Kong" AND (adjustment OR acculturation OR "acculturative stress")

Limitation used:

Location: Hong Kong
Peer reviewed journal
Publication Date: After January 01 2005

Search result as at 20 July 2016:

Out of 11 articles in the search result, 4 are relevant to the scope of the present study as follows:

1. Cheung, A. C., & Yuen, T. W. (2016). Examining the motives and the future career intentions of mainland Chinese pre-service teachers in Hong Kong. *Higher Education*, *71*(2), 209-229.

2. Cheung, A. C. (2013). Language, academic, socio-cultural and financial adjustments of mainland Chinese students studying in Hong Kong. *International Journal of Educational Management*, *27*(3), 221-241.

3. Cheung, C. K., & Yue, X. D. (2013). Sustaining resilience through local connectedness among sojourn students. *Social indicators research*, *111*(3), 785-800.

4. Pan, J. Y., Wong, D. F. K., Joubert, L., & Chan, C. L. W. (2008). The protective function of meaning of life on life satisfaction among Chinese students in Australia and Hong Kong: A cross-cultural comparative study. *Journal of American College Health*, *57*(2), 221-232.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

EBSCOhost

Databases used:

Academic Search Alumni Edition, Academic Search Premier, British Education Index, CINAHL with Full Text, CINAHL Plus with Full Text , Education Full Text (H.W. Wilson), Education Research Complete, Environment Complete, ERIC, Gender Studies Database, MAS Ultra-School Edition, MEDLINE, Mental Measurements Yearbook, Primary Search, Professional Development Collection, PsycARTICLES, PsycBOOKS, PsycINFO, SPORTDiscus with Full text, Teacher Reference Center, Business Source Premier, Computers & Applied Sciences Complete

Key terms used in the search command:

("international student" OR "non-local student" OR "student from mainland China" OR "mainland Chinese student" OR "Chinese student" OR "Chinese university student") AND ("Hong Kong") AND (adjustment OR acculturation OR "acculturation stress")

Limitation used:

Publication date: 2005-2016
Limit to: Scholarly (Peer Reviewed) Journals

Search result as at 20 July 2016:

Out of 7 articles in the search result, 4 are relevant to the scope of the present study as follows:

1. Pan, J. Y., Ye, S., & Ng, P. (2016). Validation of the Automatic Thoughts Questionnaire (ATQ) Among Mainland Chinese Students in Hong Kong. *Journal of clinical psychology*, *72*(1), 38-48.

2. Cheung, C. K., & Yue, X. D. (2013). Sustaining resilience through local connectedness among sojourn students. *Social indicators research*, *111*(3), 785-800.

3. Pan, J. Y., Yue, X., & Chan, C. L. (2010). Development and validation of the Acculturative Hassles Scale for Chinese Students (AHSCS): An example of mainland Chinese university students in Hong Kong. *Psychologia*, *53*(3), 163-178.

4. Pan, J. Y., Wong, D. F. K., Joubert, L., & Chan, C. L. W. (2007). Acculturative stressor and meaning of life as predictors of negative affect in acculturation: A cross-cultural comparative study between Chinese international students in Australia and Hong Kong. *Australian and New Zealand Journal of Psychiatry*, *41*(9), 740-750. doi: 10.1080/00048670701517942

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 1

A summary of systematic search of empirical articles from online select databases in ProQuest and EBSCOhost

Year	Author(s)	Sample participants	Central Theme
2016	Pan, J. Y., Ye, S., & Ng, P.	most of the mainland Chinese students pursing **undergraduate** or **postgraduate** studies in 8 universities in Hong Kong	Validation of the combined version of the 8-item Automatic Thought Questionnaire (ATQ) and 10 positive items from the ATQ-revised, based on sample participants
2016	Cheung, A. C., & Yuen, T. W.	mainland Chinese **undergraduates** in an education-focused university pursuing per-service teacher training in Hong Kong	The sample participants' motives, educational experiences, and plan after graduation
2013	Cheung, A. C.	mainland Chinese **undergraduates** and **postgraduates** in 7 universities in Hong Kong	Language, academic, social-cultural and financial adjustments among the sample participants
2013	Cheung, C. K., & Yue, X. D.	mainland Chinese **undergraduates** and **postgraduates** in a university in Hong Kong	Effect of local connectedness on resilience and depressed mood
2010	Pan, J. Y., Yue, X., & Chan, C. L.	Mainland Chinese **postgraduates** in 6 universities in Hong Kong	Development and validation of Acculturative Hassles Scale for Chinese Students (AHSCS), based on sample participants
2008	Pan, J. Y., Wong, D. F. K., Joubert, L., & Chan, C. L. W.	mainland Chinese **postgraduates** in 6 universities in Hong Kong and mainland Chinese **undergraduates** and **postgraduates** in a university in Australia	A comparison of the predictive effects of acculturative stressors and meaning of life on life satisfaction between mainland Chinese students in Australia and in Hong Kong
2007	Pan, J. Y., Wong, D. F. K., Joubert, L., & Chan, C. L. W.	mainland Chinese **postgraduates** in 6 universities in Hong Kong and mainland Chinese **undergraduates** and **postgraduates** in a university in Australia	A comparison of the predictive effects of acculturative stressors and meaning of life on negative affect in acculturation between mainland Chinese students in Australia and in Hong Kong

In summary, in the systematic search for studies on mainland Chinese students in Hong Kong, the following articles were founded in electronic databases in ProQuest and EBSCOhost, listing in chronological order:

1. Cheung, A. C., & Yuen, T. W. (2016). Examining the motives and the future career intentions of mainland Chinese pre-service teachers in Hong Kong. *Higher Education*, *71*(2), 209-229.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

2. Pan, J. Y., Ye, S., & Ng, P. (2016). Validation of the Automatic Thoughts Questionnaire (ATQ) Among Mainland Chinese Students in Hong Kong. *Journal of clinical psychology, 72*(1), 38-48.

3. Cheung, A. C. (2013). Language, academic, socio-cultural and financial adjustments of mainland Chinese students studying in Hong Kong. *International Journal of Educational Management*, *27*(3), 221-241.

4. Cheung, C. K., & Yue, X. D. (2013). Sustaining resilience through local connectedness among sojourn students. *Social indicators research*, *111*(3), 785-800.

5. Pan, J. Y., Yue, X., & Chan, C. L. (2010). Development and validation of the Acculturative Hassles Scale for Chinese Students (AHSCS): An example of mainland Chinese university students in Hong Kong. *Psychologia, 53*(3), 163-178.

6. Pan, J. Y., Wong, D. F. K., Joubert, L., & Chan, C. L. W. (2008). The protective function of meaning of life on life satisfaction among Chinese students in Australia and Hong Kong: A cross-cultural comparative study. *Journal of American College Health*, *57*(2), 221-232.

7. Pan, J. Y., Wong, D. F. K., Joubert, L., & Chan, C. L. W. (2007). Acculturative stressor and meaning of life as predictors of negative affect in acculturation: A cross-cultural comparative study between Chinese international students in Australia and Hong Kong. *Australian and New Zealand Journal of Psychiatry, 41*(9), 740-750. doi: 10.1080/00048670701517942

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 2: A systematic search for acculturative stress scale for international students, especially mainland Chinese students in Hong Kong

ProQuest

Databases used:

ABI/INFORM Collection, Australian Education Index, Education Database, ERIC, PAIS Index, Physical Education Index, PILOTS, Research Library, Social Services Abstracts, Sociological Abstracts

Key terms used in the search command:

("acculturative stress scale" OR "acculturative hassles scale") AND student

Limitation used:

Peer reviewed journal

Search result as at 21 July 2016:

Out of 86 articles in the search result, 2 were relevant to the scope of the present search as follows:

1. Bai, J. (2016). Development and validation of the Acculturative Stress Scale for Chinese College Students in the United States (ASSCS). *Psychological assessment*, *28*(4), 443.

2. Sandhu, D. S., & Asrabadi, B. R. (1994). Development of an acculturative stress scale for international students: Preliminary findings. *Psychological reports*, *75*(1), 435-448.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ProQuest

Databases used:

ABI/INFORM Collection, Australian Education Index, Education Database, ERIC, PAIS Index, Physical Education Index, PILOTS, Research Library, Social Services Abstracts, Sociological Abstracts

Key terms used in the search command:

"student life stress"

Limitation used:

Peer reviewed journal

Search result as at 24 July 2016:

Out of 24 articles in the search result, none was relevant to the scope of the present search.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ProQuest

Databases used:

ABI/INFORM Collection, Australian Education Index, Education Database, ERIC, PAIS Index, Physical Education Index, PILOTS, Research Library, Social Services Abstracts, Sociological Abstracts

Key terms used in the search command:

“life stress” AND
("international student" OR "foreign student" OR "overseas student" OR "Asian student" OR "East Asian student" OR "Chinese student")

Limitation used:

Peer reviewed journal

Search result as at 25 July 2016:

Out of 76 articles in the search result, none was relevant to the scope of the present search.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

EBSCOhost

Databases used:

Academic Search Alumni Edition, Academic Search Premier, British Education Index, CINAHL with Full Text, CINAHL Plus with Full Text , Education Full Text (H.W. Wilson), Education Research Complete, Environment Complete, ERIC, Gender Studies Database, MAS Ultra-School Edition, MEDLINE, Mental Measurements Yearbook, Primary Search, Professional Development Collection, PsycARTICLES, PsycBOOKS, PsycINFO, SPORTDiscus with Full text, Teacher Reference Center, Business Source Premier, Computers & Applied Sciences Complete

Key terms used in the search command:

("acculturative stress scale" OR "acculturative hassles scale") AND student

Limitation used:

Limit to: Scholarly (Peer Reviewed) Journals

Search result as at 21 July 2016:

Out of 23 articles in the search result, 4 were relevant to the scope of the present search as follows:

1. Bai, J. (2016). Development and validation of the Acculturative Stress Scale for Chinese College Students in the United States (ASSCS). *Psychological assessment, 28*(4), 443.

2. Suh, H., Rice, K. G., Choi, C. C., van Nuenen, M., Zhang, Y., Morero, Y., & Anderson, D. (2016). Measuring acculturative stress with the SAFE: Evidence for longitudinal measurement invariance and associations with life satisfaction. *Personality and Individual Differences*, *89*, 217-222.

3. Pan, J. Y., Yue, X., & Chan, C. L. (2010). Development and validation of the Acculturative Hassles Scale for Chinese Students (AHSCS): An example of mainland Chinese university students in Hong Kong. *Psychologia*, *53*(3), 163-178.

4. Sandhu, D. S., & Asrabadi, B. R. (1994). Development of an acculturative stress scale for international students: Preliminary findings. *Psychological reports*, *75*(1), 435-448.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

EBSCOhost

Databases used:

Academic Search Alumni Edition, Academic Search Premier, British Education Index, CINAHL with Full Text, CINAHL Plus with Full Text , Education Full Text (H.W. Wilson), Education Research Complete, Environment Complete, ERIC, Gender Studies Database, MAS Ultra-School Edition, MEDLINE, Mental Measurements Yearbook, Primary Search, Professional Development Collection, PsycARTICLES, PsycBOOKS, PsycINFO, SPORTDiscus with Full text, Teacher Reference Center, Business Source Premier, Computers & Applied Sciences Complete

Key terms used in the search command:

"student life stress"

Limitation used:

Limit to: Scholarly (Peer Reviewed) Journals

Search result as at 24 July 2016:

Out of 39 articles in the search result, none was relevant to the scope of the present search.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

EBSCOhost

Databases used:

Academic Search Alumni Edition, Academic Search Premier, British Education Index, CINAHL with Full Text, CINAHL Plus with Full Text , Education Full Text (H.W. Wilson), Education Research Complete, Environment Complete, ERIC, Gender Studies Database, MAS Ultra-School Edition, MEDLINE, Mental Measurements Yearbook, Primary Search, Professional Development Collection, PsycARTICLES, PsycBOOKS, PsycINFO, SPORTDiscus with Full text, Teacher Reference Center, Business Source Premier, Computers & Applied Sciences Complete

Key terms used in the search command:

"life stress" AND
("international student" OR "foreign student" OR "overseas student" OR "Asian student" OR "East Asian student" OR "Chinese student")

Limitation used:

Limit to: Scholarly (Peer Reviewed) Journals

Search result as at 25 July 2016:

Out of 4 articles in the search result, 1 was relevant to the scope of the present search as follows:

1. Yang, B., & Clum, G. A. (1995). Measures of life stress and social support specific to an Asian student population. *Journal of Psychopathology and Behavioral Assessment*, *17*(1), 51-67.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table 1.

A summary of systematic search of empirical articles from online select databases in ProQuest and EBSCOhost

Year	Author(s)	Sample participants	Central Theme
2016	Bai, J.	Chinese students pursing **undergraduate** or **postgraduate** studies in the United States	Development and validation of the Acculturative Stress Scale for Chinese College Students (ASSCS) in the United States
2016	Suh, H., Rice, K. G., Choi, C. C., van Nuenen, M., Zhang, Y., Morero, Y., & Anderson, D.	International **postgraduates** (mainly are India, Chinese and other Asian) at a university in the United States	Confirmatory factor analyses of 5 different measurement models to lead to a revised version of Social, Attitudinal, Familial, and Environmental Acculturative Stress Scale (SAFE) with 2 factors: General Stress, and Family Stress
2010	Pan, J. Y., Yue, X., & Chan, C. L.	Mainland Chinese **postgraduates** in 6 universities in Hong Kong	Development and validation of Acculturative Hassles Scale for Chinese Students (AHSCS), based on sample participants
1995	Yang, B., & Clum, G. A.	Asian students (no mention of their levels of studies) at a southeastern university in the United States	Designing an Index of Life Stress (ILS) to assess the levels of stressful life events experienced by Asian international students in the United States
1994	Sandhu, D. S., & Asrabadi, B. R.	International students pursuing **undergraduate** or **postgraduate** studies in the United States	Development of an Acculturative Stress Scale for International Students (ASSIS) in the United States

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

In summary, in the systematic search for acculturative stress scale for international students, especially mainland Chinese students in Hong Kong, the following articles were founded in electronic databases in ProQuest and EBSCOhost, listed in chronological order:

1. Bai, J. (2016). Development and validation of the Acculturative Stress Scale for Chinese College Students in the United States (ASSCS). *Psychological assessment*, *28*(4), 443.

2. Suh, H., Rice, K. G., Choi, C. C., van Nuenen, M., Zhang, Y., Morero, Y., & Anderson, D. (2016). Measuring acculturative stress with the SAFE: Evidence for longitudinal measurement invariance and associations with life satisfaction. *Personality and Individual Differences*, *89*, 217-222.

3. Pan, J. Y., Yue, X., & Chan, C. L. (2010). Development and validation of the Acculturative Hassles Scale for Chinese Students (AHSCS): An example of mainland Chinese university students in Hong Kong. *Psychologia*, *53*(3), 163-178.

4. Yang, B., & Clum, G. A. (1995). Measures of life stress and social support specific to an Asian student population. *Journal of Psychopathology and Behavioral Assessment*, *17*(1), 51-67.

5. Sandhu, D. S., & Asrabadi, B. R. (1994). Development of an acculturative stress scale for international students: Preliminary findings. *Psychological reports*, *75*(1), 435-448.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 3: Acculturative Stress Scale for International Students (ASSIS)

The English version of ASSIS (adapted and rearranged from Sandhu & Asrabadi, 1994, pp. 441, 443) is as follows[2]:

Perceived discrimination

3. I am treated differently in social situations.
9. Others are biased toward me.
11. Many opportunities are denied to me.
14. I feel that I receive unequal treatment.
17. I am denied what I deserve.
23. I feel that my people are discriminated against.
26. I am treated differently because of my race.
29. I am treated differently because of my color.

Homesickness

1. Homesickness bothers me.
6. I feel sad living in unfamiliar surroundings.
21. I miss the people and country of my origin.
35. I feel sad leaving my relatives behind.

Perceived hate/rejection

4. Others are sarcastic toward my cultural values.
15. People show hatred toward me nonverbally.
20. Others don't appreciate my cultural values.
24. People show hatred toward me through actions.
33. People show hatred toward me verbally.

Fear

7. I fear for my personal safety because of my different cultural background.
18. I frequently relocate for fear of others.
27. I feel insecure here.
31. I generally keep a low profile due to fear.

Stress due to change/culture shock

2. I feel uncomfortable to adjust to new foods.
13. Multiple pressures are placed upon me after migration.
22. I feel uncomfortable to adjust to new cultural values.

Guilt

10. I feel guilty to leave my family and friends behind.
34. I feel guilty that I am living a different lifestyle here.

Non-specific/miscellaneous

---

[2] Response ranges from 1 as 'Strongly disagree' through 5 as 'Strongly agree' with 3 as 'Not sure'.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

5. I feel nervous to communicate in English.
8. I feel intimidated to participate in social activities.
12. I feel angry that my people are considered inferior here.
16. It hurts when people don't understand my cultural values.
19. I feel low because of my cultural background.
25. I feel that my status in this society is low due to my cultural background.
28. I don't feel a sense of belonging (community) here.
30. I feel sad to consider my people's problems.
32. I feel some people don't associate with me because of my ethnicity.
36. I worry about my future for not being able to decide whether to stay here or to go back.

With the aid of online translators[3] and dictionaries[4], the translated version of ASSIS in mainland Chinese (adapted and rearranged from Bai, 2012, pp. 99-100) was compiled as follows[5]:

感觉被歧视

3. 在社交场合中, 我受到不同的对待。
9. 其他人对我有偏见。
11. 很多机会都拒绝給我。
14. 我觉得我受到不平等的对待。
17. 我被剥夺了我应得的。
23. 我觉得我的同胞受到歧视。
26. 由于我的种族，我受到不同的对待。
29. 由于我的肤色，我受到不同的对待。

乡愁

1. 思乡之情困扰我。
6. 我因为生活在不熟悉的环境中而感到悲伤。
21. 我思念祖国及那里的同胞。
35. 我因为离开亲戚而感到伤心。

感觉被憎恶/排斥

4. 别人讥讽我的文化价值。
15. 人们用非语言的方式对我显示憎恶。
20. 别人不欣赏我的文化价值观。

---

[3] The online translators are: Google Translate, Bing Translator, Reverso Translation, Systranet Translator, ICIBA Translation, Dict.cn Translation, and NAVER Korean Translator.

[4] The online dictionaries are: Cambridge English–Chinese (Simplified) Dictionary, Yahoo!字典, ICIBA Dictionary, Dict.cn Dictionary, and Linguee 英中词典.

[5] 选项范围从 1 为 ‘强烈不同意’, 3 为 ‘不确定’, 到 5 为 ‘强烈同意’。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

24. 人们用行为对我显示憎惡。
33. 人们用语言对我显示憎惡。

害怕

7. 由於我的不同文化背景，我害怕我的人身安全。
18. 我经常搬迁，生怕别人。
27. 在这里，我感到不安全。
31. 由于害怕，我一般保持低调。

由于变化或文化冲击造成的压力

2. 对于适应新的食物，我感到不舒服。
13. 在迁移后，我承受多重压力。
22. 对于适应新的文化价值观，我感到不舒服。

内疚

10. 离开家人和朋友令我感到内疚。
34. 在这里，我过着不同的生活方式令我感到内疚。

非特定或其他

5. 我对用英语沟通感到紧张。
8. 我对参加社交活动感到畏縮。
12. 我对在这里的同胞被认为低人一等感到愤怒。
16. 当人们不了解我的文化价值观时，我会感到心痛。
19. 因我的文化背景，我会感到情绪低落。
25. 因我的文化背景，我觉得我在这个社会中的地位低一点。
28. 在这里，我不感到有归属感或社群意识。
30. 当想到同胞的问题时，我感到难过。
32. 因为我的种族背景，我感到有一些人不与我交往。
36. 因不能决定是否留下还是回去，我担心我的未来。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 4: Search results from electronic databases of Scopus and Web of Science

Use "acculturative stress scale for international students" as keyword search in Scopus and Web of Science as at 18 January 2017 (listed in chronological order)

The search results were as follows:

Liu, Y., Chen, X., Li, S., Yu, B., Wang, Y., & Yan, H. (2016). Path analysis of acculturative stress components and their relationship with depression among international students in China. *Stress and Health*, *32*(5), 524-532.

Akhtar, M., & Kröner-Herwig, B. (2015). Acculturative stress among international students in context of socio-demographic variables and coping styles. *Current Psychology*, *34*(4), 803-815.

Yu, B., Chen, X., Li, S., Liu, Y., Jacques-Tiura, A. J., & Yan, H. (2014). Acculturative stress and influential factors among international students in China: A structural dynamic perspective. *PLoS ONE, 9*(4): e96322. doi:10.1371/journal.pone.

He, F. X., Lopez, V., & Leigh, M. C. (2012). Perceived acculturative stress and sense of coherence in Chinese nursing students in Australia. *Nurse Education Today*, *32*(4), 345-350.

Bhandari, P. (2012). Stress and health related quality of life of Nepalese students studying in South Korea: A cross sectional study. *Health and Quality of Life Outcomes*, *10*(26), 1-9.

Chavajay, P., & Skowronek, J. (2008). Aspects of acculturation stress among international students attending a university in the USA. *Psychological reports*, *103*(3), 827-835.

Sandhu, D. S., & Asrabadi, B. R. (1994). Development of an acculturative stress scale for international students: Preliminary findings. *Psychological Reports*, *75*(1), 435-448.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 5: Index of Life Stress (ILS)

The English version of ILS (adapted and rearranged from Yang & Clum, 1995, p. 62) is as follows[6]:

Concern about finance and desire to stay in the U.S.

16. I worry about whether I will have my future career in the U.S.A.
22. I worry about my financial situation.
25. My financial situation influences my academic study.
26. I worry about my future: will I return to my home country or stay in the U.S.A.
28. I don't want to return to my home country, but I may have to do so.
31. My financial situation makes my life here very hard.

Language difficulties

1. My English embarrasses me when I talk to people.
7. My English makes it hard for me to read articles, books, etc.
8. It's hard for me to develop opposite-sex relationships here.
20. I can't express myself well in English.
29. My English makes it hard for me to understand lectures.

Interpersonal stress

5. I can feel racial discrimination toward me from other students.
11. People treat me badly just because I am a foreigner.
13. I think that people are very selfish here.
15. I can feel racial discrimination toward me in stores.
19. I can feel racial discrimination toward me from professors.
24. I can feel racial discrimination toward me in restaurants.

Stress from new culture and desire to return to one's own country

2. I don't like the religions in the U.S.A.
4. I worry about whether I will have my future career in my own country.
10. I don't like American food.
14. I don't like the things people do for their entertainment here.
17. Americans' way of being too direct is uncomfortable to me.
23. I don't like American music.
27. I haven't become used to enjoying the American holidays.
30. I want to go back to my home country in the future, but I may not be able to do so.

Academic pressure

3. I worry about my academic performance.
6. I'm not doing as well as I want to in school.
9. I don't like the ways people treat each other here.
18. I study very hard in order not to disappoint my family.
21. It would be the biggest shame for me if I fail in school.

[6] Response ranges from 0 as 'Never' through 3 as 'Often'.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

With the aid of online translators[7] and dictionaries[8], the translated version of ILS in simplified Chinese was compiled as follows[9]:
关注财政和渴望留在美国

16. 我担心未来可否在美国有我的职业生涯。
22. 我担心我的财务状况。
25. 我的财务状况影响我的学业。
26. 我担心我的未来:返回祖国或留在美國。
28. 我不想返回祖国，但可能不得不回去。
31. 我的财务状况令我在这里的生活很艰苦。

语言困难

1. 当我跟别人聊天的时候，我的英语水平令我感到尴尬。
7. 我的英语水平让我很难阅读文章，书籍等。
8. 我很难在这里发展异性关系。
20. 我不能用英语很好地表达自己。
29. 我的英语水平令我难以理解讲座。

人际压力

6. 由于我的种族,我感到被其他学生歧视。
11. 只是因为我是外国人,我被待薄。
14. 我认为这里的人很自私。
15. 在商店里,由于我的种族,我感到被歧视。
19. 由于我的种族,我感到被教授歧视。
24. 在餐馆里,由于我的种族,我感到被歧视。

來自新文化的压力和回归祖国的渴望

2. 我不喜欢美国的宗教。
4. 我担心未来可否在祖国有我的职业生涯。
11. 我不喜欢美国食物。
14. 我不喜欢这里的人们为了娱乐而做的事情。
17. 对我来说,美国人太直接的方式是不舒服的。
23. 我不喜欢美国音乐。
27. 我还没变得习惯享受美国的假日。
30. 我想未来返回祖国，但可能不能做到。

学业压力

3. 我担心我的学业成绩。

---

[7] The online translators are: Google Translate, Bing Translator, Reverso Translation, Systranet Translator, ICIBA Translation, Dict.cn Translation, and NAVER Korean Translator.
[8] The online dictionaries are: Cambridge English–Chinese (Simplified) Dictionary, Yahoo!字典, ICIBA Dictionary, Dict.cn Dictionary, and Linguee 英中词典.
[9] 选项范围从 0 为 ‘从未发生’ 到 3 为 ‘经常存在’。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

6. 我在学校的表现不如我期望的好。
9. 我不喜欢这里的人们对待彼此的方式。
18. 为了不让我的家人失望，我非常努力地学习。
21. 如未能完成学业，会是我最大的耻辱。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 6: Acculturative Hassles Scale for Chinese Students (AHSCS)

The mainland Chinese version of AHSCS (adapted and rearranged from Pan, Yue, & Chan, 2010, p. 178) is as follows[10]:

语言障碍

3. 我不能很自如地用英语表达自己的想法。
12. 上课或参加研讨会的时候我不敢用英语发言。
16. 我的英语词汇量不足，要用的时候总觉得不够用。
8. 我不习惯英文的思维方式。

学术工作

4. 对我来说发表学术论文有很大压力。
6. 我觉得在学业上我很难达到导师的期望。
15. 和周围的同学相比我会觉得有压力。
1. 刚来香港的时候，我不知道该从哪里着手开始我的学习。
10. 我经常担心自己能否按时毕业。

文化差异

11. 香港和内地的文化差异很大，这让我觉得不太适应。
13. 我对香港的期望和实际情况有很大的差距。
17. 我在适应新的文化和价值观的时候觉得不舒服。
9. 我担心香港人会歧视内地人。

社交联系

7. 我很难融入到香港人的生活圈子里去，我和香港人的关系都是一般的工作关系。
5. 在香港，我的社会空间很小，不是在办公室，就是在家里。
14. 我很难真正融入到香港本地的文化中去。
2. 在香港我没有新的社会网络。

The English version of AHSCS (adapted from Pan, Yue, & Chan, 2010, p. 171) is as follows[11]:

Language deficiency

3. I am not able to express my ideas in English fluently.
12. I dare not speak in English in class or seminars.
16. I do not have a sufficient English vocabulary.
8. I am not accustomed to the English way of thinking.

Academic work

---

[10] 四个选项是： 0 为 ‘没有或不适用’， 1 为 ‘有点’， 2 为 ‘适中’，及 3 为 ‘很多’。

[11] Four responses are: 0 as ‘Not at all’ or ‘ Not applicable’, 1 as ‘A little’, 2 as ‘Moderate’, and 3 as ‘A lot’.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

4. Publishing academic papers in English is difficult for me.
6. It is difficult for me to reach my supervisor's expectation of my study.
15. I feel pressured when making comparisons with fellow students.
1. When I first arrived in Hong Kong, I did not know how to start my study.
10. I am worried whether I can graduate as scheduled.

Cultural difference

11. There are great cultural differences between Hong Kong and the Mainland which make me feel maladaptive.
13. There is huge gap between my expectation about Hong Kong and the actual situation.
17. I feel uncomfortable when I am trying to adapt to a new culture.
9. I worry that Hong Kong people will discriminate against people from the Mainland.

Social interaction

7. It is difficult for me to integrate into the social circle of local people. My relationships with locals are general working relationships.
5. My social space in Hong Kong is very small. I am either at work or at home.
14. It is very difficult for me to integrate into the local culture in Hong Kong.
2. I do not have a new social network in Hong Kong.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 7: Revised version of Social, Attitudinal, Familial, and Environmental Acculturative Stress Scale-Short Form ("RSAFE")

The English version of RSAFE (adapted and rearranged from Suh et al., 2016, p. 220) is as follows[12]:

General stress

1. I often feel ignored by people who are supposed to assist me.
2. It bothers me when people pressure me to assimilate.
3. Many people have stereotypes about my culture or ethnic group and treat me as if they are true.
4. Because I am different I do not get enough credit for the work I do.
5. Because of my ethnic background, I feel that others often exclude me from participating in their activities.
6. People look down upon me if I practice customs of my culture.
7. I don't have any close friends.
8. People think I am unsociable when in fact I have trouble communicating in English.
9. Loosening the ties with my country is difficult.
10. I often think about my cultural background.

Family stress

11. Close family members and I have conflicting expectations about my future.
12. It bothers me that family members I am close to do not understand my new values.
13. My family does not want me to move away but I would like to.

With the aid of online translators[13] and dictionaries[14], the translated version of RSAFE in simplified Chinese was compiled as follows[15]:

一般压力

1. 我经常被那些应该帮助我的人忽视。
2. 当人们强迫我同化时，我会很烦恼。
3. 许多人对我的文化或种族有成见，把这些成見当成真的来对待我。
4. 由于我是另类，我所做的工作得不到充分的赞许。
5. 由于我的种族背景，我觉得别人经常排斥我参加他们的活动。
6. 如果我信奉我的文化习俗，人们会看不起我。
7. 我在香港没有任何知己。
8. 人们认为我是不爱交际，事实是我有困难用英语沟通。

---

[12] Response ranges from 1 as 'Not stressful' through 5 as 'Extremely stressful'.
[13] The online translators are: Google Translate, Bing Translator, Reverso Translation, Systranet Translator, ICIBA Translation, Dict.cn Translation, and NAVER Korean Translator.
[14] The online dictionaries are: Cambridge English–Chinese (Simplified) Dictionary, Yahoo!字典, ICIBA Dictionary, Dict.cn Dictionary, and Linguee 英中词典.
[15] 选项范围从 1 为 '没有压力' 到 5 为 '极大压力'。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

9. 疏远与祖国的关系是困难的。
10. 我经常想念我的文化背景。

家庭压力

11. 近亲和我对我未来的期望有冲突。
12. 近亲不了解我的新价值观令我感到困扰。
13. 家人不想我搬离，但我要离家。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 8: Acculturative Stress Scale for Chinese College Students (ASSCS)

The mainland Chinese version of ASSCS (adapted and rearranged from Bai, 2012, pp. 119-120) is as follows[16]:

语言障碍

1. 上课或参加研讨会的时候我不敢用英文发言。
7. 上课的时候我很难听懂老师和同学的对话。
8. 我不能很自如的用英语表达自己的想法。
13. 我用英文沟通时会感到很紧张。
18. 我因为无法参加课堂讨论而感到挫败。
20. 我不习惯英文的思维方式。
23. 当我需要用英语做报告时，我感到不自信。
26. 我的英文词汇量不足，要用的时候总觉得不够用。
29. 用英文发表学术文章让我感到压力很大。
30. 因为英语不好，我试图逃避社交场合。

社会隔离

2. 来美之后，我的社交圈子越来越小。
4. 我感到很无助。
9. 在美国我的朋友很少。
10. 我在美国没有归属感。
16. 我觉得美国的生活很无聊。
21. 我的社会生活很少。
27. 我在美国感到非常孤单。
31. 在美国我没有新的社会网络。

种族歧视

3. 我感到我受到了不平等的待遇。
6. 因为我的种族背景我受到了不同的待遇。
11. 有一些种族的人对我表现出厌恶。
14. 其他人对我有偏见。
17. 我觉得我的同胞被歧视。
22. 我为我的同胞在这里低人一等而感到愤怒。
28. 我觉得有一些人因为我的种族背景而不与我交往。

学业压力

5. 我感到学业压力很大。
15. 我常常需要超时学习去赶上进度。。
24. 高强度的学习损害了我的身体健康。
32. 学业上的压力使我的生活质量下降。

对家庭的愧疚感

[16] 选项范围从 1 为 ‘从未发生’ 到 7 为 ‘一直存在’。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

12. 我很担心我的父母。
19. 我为离开我的家人和朋友而感到内疚。
25. 我为不能照顾我的父母感到愧疚。

The English version of ASSCS (adapted and rearranged from Bai, 2012, pp. 121-122) is as follows[17]:

Language Insufficiency

1. I hesitate to participate in class discussion and seminar.
7. It is hard for me to follow the lectures and conversations in classes.
8. I cannot express myself very well when using English.
13. I feel nervous to communicate in English.
18. I feel frustrated that I am not able to participate in class discussions.
20. I am not used to the English way of thinking.
23. I lack confidence when I have to do presentations in English.
26. My vocabulary is so small that I always feel short of words.
29. It is a big pressure for me to publish academic paper in English.
30. I shy away from social situations due to my limited English.

Social isolation

2. My social circles shrank after I come to the U.S.
4. I feel helpless.
9. I do not have many friends in the U.S.
10. I don't feel a sense of belonging (community) here.
16. I feel bored here.
21. I have limited social life.
27. I feel lonely in the U.S.
31. I do not have new social network here.

Perceived discrimination

3. I feel that I receive unequal treatment.
6. I am treated differently because of my race.
11. People from some other ethnic groups show hatred toward me.
14. I feel that others are biased toward me.
17. I feel that my people are discriminated against.
22. I feel angry that my people are considered inferior here.
28. I feel some people don't associate with me because of my ethnicity.

Academic pressure

5. I feel a lot of academic pressure.
15. I often have to work overtime in order to catch up.
24. The intensive study makes me sick.
32. Academic pressure has lowered the quality of my life.

[17] Response ranges from 1 as 'Never' through 7 as 'All the time'.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Guilt toward family

12. I worry about my parents.
19. I feel guilty to leave my family and friends behind.
25. I feel guilty that I cannot take care of my parents.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 9: Item pool for the Acculturative Stress Scale for mainland Chinese undergraduate students in Hong Kong (ASSMCUS)

Initial ASSMCUS in 8 subscales with 114 items—mainland Chinese version

分量表	条项		来源
语言困难 (13)	1.	上课或参加研讨会的时候我不敢用英文发言。	ASSCS
	2.	我不能很自如的用英语表达自己的想法。	ASSCS
	3.	我用英文沟通时会感到很紧张。	ASSCS
	4.	我因为无法参加课堂讨论而感到挫败。	ASSCS
	5.	当我需要用英语做报告时，我感到不自信。	ASSCS
	6.	我的英文词汇量不足，要用的时候总觉得不够用。	ASSCS
	7.	因为英语不好，我试图逃避社交场合。	ASSCS
	8.	当我跟别人聊天的时候，我的英语水平令我感到尴尬。	ILS
	9.	我的英语水平让我很难阅读文章，书籍等。	ILS
	10.	我的英语水平令我难以理解讲座。	ILS
	11.	上课或参加研讨会的时候我不敢用英语发言。	AHSCS
	12.	我不习惯英文的思维方式。	AHSCS
	13.	人们认为我是不爱交际，事实是我有困难用英语沟通。	RSAFE
学业压力 (11)	14.	我感到学业压力很大。	ASSCS
	15.	為了趕上学习进度,我常常要学习到很晚。	ASSCS
	16.	我对密集的的学习感到非常不快。	ASSCS
	17.	学业上的压力使我的生活质量下降。	ASSCS
	18.	我觉得在学业上我很难达到老师的期望。	AHSCS
	19.	在学业上，和周围的同学相比我会觉得有压力。	AHSCS
	20.	刚来香港的时候，我不知道该从哪里着手开始我的学习。	AHSCS
	21.	我担心自己能否按时毕业。	AHSCS
	22.	我担心我的学业成绩。	ILS
	23.	我在学校的表现不如我期望的好。	ILS
	24.	如未能完成学业，会是我最大的耻辱。	ILS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

文化差异 (16)	25.	香港和内地的文化差异很大，这让我觉得不太适应。	AHSCS
	26.	我对香港的期望和实际情况有很大的差距。	AHSCS
	27.	我在适应新的文化和价值观的时候觉得不舒服。	AHSCS
	28.	在迁移后，我承受多重压力。	ASSIS
	29.	当人们强迫我同化时，我会很烦恼。	RSAFE
	30.	疏远与祖国的关系是困难的。	RSAFE
	31.	我经常想念我的文化背景。	RSAFE
	32.	对于适应新的食物，我感到不舒服。	ASSIS
	33.	我不喜欢香港食物。	ILS
	34.	我不喜欢香港音乐。	ILS
	35.	因我的文化背景，我会感到情绪低落。	ASSIS
	36.	因我的文化背景，我觉得我在这个社会中的地位低一点。	ASSIS
	37.	当人们不了解我的文化价值观时，我会感到心痛。	ASSIS
	38.	当想到同胞的问题时，我感到难过。	ASSIS
	39.	我还没变得习惯享受香港的假日。	ILS
	40.	我不喜欢这里的人们对待彼此的方式。	ILS
社交联系 (15)	41.	来香港后，我的社交圈子越来越小。	ASSCS
	42.	我感到很无助。	ASSCS
	43.	在香港，我的朋友很少。	ASSCS
	44.	我对香港没有归属感。	ASSCS
	45.	我对我在香港的生活感到厌倦。	ASSCS
	46.	我的社交生活很少。	ASSCS
	47.	我在香港感到非常孤单。	ASSCS
	48.	我在香港没有任何知己。	RSAFE
	49.	我很难融入到香港人的生活圈子里去，我和香港人的关系都是一般的工作关系。	AHSCS
	50.	在香港，我的社会空间很小，不是在办公室，就是在家里。	AHSCS
	51.	我很难真正融入到香港本地的文化中去。	AHSCS
	52.	在香港我没有新的社交网络。	AHSCS
	53.	我对参加社交活动感到畏缩。	ASSIS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	54.	我很难在这里发展异性关系。	ILS
	55.	因为我的内地背景，我觉得有些人不跟我联系。	ASSCS
感觉被歧视 (23)	56.	我擔心香港人會歧視來自中國大陸的同胞。	AHSCS
	57.	我觉得我受到不平等的对待。	ASSIS
	58.	因我來自內地，我受到了不同的对待。	ASSCS
	59.	有些香港人对我表示憎惡。	ASSCS
	60.	我感到其他人对我有偏见。	ASSIS
	61.	我觉得我的内地同胞受到歧视。	ASSIS
	62.	我觉得内地同胞在这里被认为是低下的。	ASSIS
	63.	我经常被那些应该帮助我的人忽视。	RSAFE
	64.	许多人对我的文化背景有成见，把这些成見当成真的来对待我。	RSAFE
	65.	由于我是另类，我所做的工作得不到充分的赞许。	RSAFE
	66.	由于我的文化背景，我觉得别人经常排斥我参加他们的活动。	RSAFE
	67.	如果我信奉我的文化习俗，人们会看不起我。	RSAFE
	68.	别人讥讽我的文化价值。	ASSIS
	69.	人们用非语言的方式对我显示憎惡。	ASSIS
	70.	别人不欣赏我的文化价值观。	ASSIS
	71.	人们用行为对我显示憎惡。	ASSIS
	72.	人们用语言对我显示憎惡。	ASSIS
	73.	我感到其他学生歧视我。	ILS
	74.	因为我是內地人, 我被待薄。	ILS
	75.	我认为这里的人很自私。	ILS
	76.	在商店里, 我感到被歧视。	ILS
	77.	我感到被教授歧视。	ILS
	78.	在餐馆里, 我感到被歧视。	ILS
家庭与乡愁 (13)	79.	思乡之情困扰我。	ASSIS
	80.	我因为生活在不熟悉的环境中而感到悲伤。	ASSIS
	81.	我思念祖国及那里的同胞。	ASSIS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	82.	我因为离开亲戚而感到伤心。	ASSIS
	83.	近亲和我对我未来的期望有冲突。	RSAFE
	84.	近亲不了解我的新价值观令我感到困扰。	RSAFE
	85.	家人对我在香港的学习有很高期望。	Xie (2009)
	86.	我要努力学习，不让家人失望。	ILS
	87.	我很担心父母。	ASSCS
	88.	我为离开家人和朋友而感到内疚。	ASSIS, ASSCS
	89.	我为不能照顾父母感到愧疚。	ASSCS
	90.	我对父母的牺牲感到内疚。	Li (2006)
	91.	在这里，我过着不同的生活方式令我感到内疚。	ASSIS
职业前景 (10)	92.	我担心能否在香港发展我的职业生涯。	ILS
	93.	我担心能否在内地发展我的职业生涯。	ILS
	94.	我担心我的未来：在内地还是香港。	ILS
	95.	我不想返回内地发展，但我可能要回去。	ILS
	96.	我想回内地发展，但我可能不会回去。	ILS
	97.	我担心我的未来因我无法决定应是留在香港还是回到内地发展。	ASSIS
	98.	我担心毕业后我能否在香港找到工作。	Kell & Vogl (2012)
	99.	我担心我的未来因我无法决定是否在毕业后应继续学习或寻找工作。	Li (2006), Xie (2009)
	100.	我担心毕业后我能否在内地找到工作。	Kell & Vogl (2012)
	101.	我担心我在香港所学的知识能否适用于内地。	Cheung & Yuen (2016)
实际生活压力 (13)	102.	我不喜欢我的宿舍/居住地方。	Lian & Tsang (2010)
	103.	我想找一个物有所值的宿舍/居住地方是很困难的。	知多一點點 2 (2015)
	104.	我的宿舍/居住地方很小使我很烦恼。	Yuen, Cheung, &

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

		Wong (2017)
105.	我的宿舍/居住地方的租金非常高，令我很难负担。	知多一點點 2 (2015), 眾新聞記者 (2018)
106.	我的宿舍/居住地方遠离校园，很不方便。	眾新聞記者 (2018)
107.	我担心我的财务状况。	ILS
108.	我的财务状况影响我的学业。	ILS
109.	我的财务状况令我在这里的生活很艰苦。	ILS
110.	香港的生活費用非常高。	Cheung (2013), Kell & Vogl (2012)
111.	香港的學費很高。	Cheung (2013)
112.	我担心我的身体健康。	Xie (2009)
113.	我担心我的心理健康。	Chui & Chan (2017)
114.	我不喜欢香港的天气。	Xie (2009)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Initial ASSMCUS in 8 subscales with 114 items—English version

Subscales	Items		Sources
Language difficulties (13)	1.	I hesitate to participate in class discussion and seminar.	ASSCS
	2.	I cannot express myself very well in English.	ASSCS
	3.	I feel nervous to communicate in English.	ASSCS
	4.	I feel frustrated that I am not able to participate in class discussions.	ASSCS
	5.	I lack confidence when I have to do presentations in English.	ASSCS
	6.	My vocabulary is so small that I always feel short of words.	ASSCS
	7.	I shy away from social situations due to my limited English.	ASSCS
	8.	My English embarrasses me when I talk to people.	ILS
	9.	My English makes it hard for me to read articles, books, etc.	ILS
	10.	My English makes it hard for me to understand lectures.	ILS
	11.	I dare not speak in English in class or seminars.	AHSCS
	12.	I am not accustomed to the English way of thinking.	AHSCS
	13.	People think I am unsociable when in fact I have trouble communicating in English.	RSAFE
Academic pressure (11)	14.	I feel a lot of academic pressure.	ASSCS
	15.	I often study late to catch up the study schedule.	ASSCS
	16.	The intensive study makes me sick.	ASSCS
	17.	Academic pressure has lowered the quality of my life.	ASSCS
	18.	It is difficult for me to reach my teachers' expectation of my study.	AHSCS
	19.	Regarding academic study, I feel pressured when making comparisons with fellow students.	AHSCS
	20.	When I first arrived in Hong Kong, I did not know how to start my study.	AHSCS
	21.	I am worried whether I can graduate as scheduled.	AHSCS
	22.	I worry about my academic performance.	ILS
	23.	I'm not doing as well as I want to in school.	ILS
	24.	It would be the biggest shame for me if I fail in school.	ILS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Cultural difference (16)	25.	There are great cultural differences between Hong Kong and the Mainland which make me feel maladaptive.	AHSCS
	26.	There is huge gap between my expectation about Hong Kong and the actual situation.	AHSCS
	27.	I feel uncomfortable when I am trying to adapt to a new culture.	AHSCS
	28.	Multiple pressures are placed upon me after migration.	ASSIS
	29.	It bothers me when people pressure me to assimilate.	RSAFE
	30.	Loosening the ties with my country is difficult.	RSAFE
	31.	I often think about my cultural background.	RSAFE
	32.	I feel uncomfortable to adjust to new foods.	ASSIS
	33.	I don't like Hong Kong food.	ILS
	34.	I don't like Hong Kong music.	ILS
	35.	I feel low because of my cultural background.	ASSIS
	36.	I feel that my status in this society is low due to my cultural background.	ASSIS
	37.	It hurts when people don't understand my cultural values.	ASSIS
	38.	I feel sad to consider my people's problems.	ASSIS
	39.	I haven't become used to enjoying the Hong Kong's holidays.	ILS
	40.	I don't like the ways people treat each other here.	ILS
Social interaction (15)	41.	My social circles shrank after I came to Hong Kong.	ASSCS
	42.	I feel helpless.	ASSCS
	43.	I do not have many friends in Hong Kong.	ASSCS
	44.	I don't feel a sense of belonging (community) here.	ASSCS
	45.	I feel bored here.	ASSCS
	46.	I have limited social life.	ASSCS
	47.	I feel lonely in Hong Kong.	ASSCS
	48.	I don't have any close friends here.	RSAFE
	49.	It is difficult for me to integrate into the social circle of local people. My relationships with locals are general working relationships.	AHSCS
	50.	My social space in Hong Kong is very small. I am either at work or at home.	AHSCS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	51.	It is very difficult for me to integrate into the local culture in Hong Kong.	AHSCS
	52.	I do not have a new social network in Hong Kong.	AHSCS
	53.	I feel intimidated to participate in social activities.	ASSIS
	54.	It's hard for me to develop opposite-sex relationships here.	ILS
	55.	I feel some people don't associate with me because of my mainland Chinese background.	ASSCS
Perceived discrimination (23)	56.	I worry that Hong Kong people will discriminate against people from mainland China.	AHSCS
	57.	I feel that I receive unequal treatment.	ASSIS
	58.	I am treated differently because I came from mainland China.	ASSCS
	59.	Some Hong Kong people show hatred toward me.	ASSCS
	60.	I feel that others are biased toward me.	ASSIS
	61.	I feel that mainland Chinese are discriminated against.	ASSIS
	62.	I feel angry that mainland Chinese are considered inferior here.	ASSIS
	63.	I often feel ignored by people who are supposed to assist me.	RSAFE
	64.	Many people have stereotypes about my cultural background and treat me as if they are true.	RSAFE
	65.	Because I am different, I do not get enough credit for the work I do.	RSAFE
	66.	Because of my cultural background, I feel that others often exclude me from participating in their activities.	RSAFE
	67.	People look down upon me if I practice customs of my culture.	RSAFE
	68.	Others are sarcastic toward my cultural values.	ASSIS
	69.	People show hatred toward me nonverbally.	ASSIS
	70.	Others don't appreciate my cultural values.	ASSIS
	71.	People show hatred toward me through actions.	ASSIS
	72.	People show hatred toward me verbally.	ASSIS
	73.	I feel discrimination toward me from other students.	ILS
	74.	People treat me badly just because I am a mainland Chinese.	ILS
	75.	I think that people are very selfish here.	ILS
	76.	I feel discrimination toward me in stores.	ILS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	77.	I feel discrimination toward me from professors.	ILS
	78.	I feel discrimination toward me in restaurants.	ILS
Family and homesickness (13)	79.	Homesickness bothers me.	ASSIS
	80.	I feel sad living in unfamiliar surroundings.	ASSIS
	81.	I miss the people and country of my origin.	ASSIS
	82.	I feel sad leaving my relatives behind.	ASSIS
	83.	Close family members and I have conflicting expectations about my future.	RSAFE
	84.	It bothers me that family members I am close to do not understand my new values.	RSAFE
	85.	My family has high expectation of me studying in Hong Kong.	Xie (2009)
	86.	I study very hard in order not to disappoint my family.	ILS
	87.	I worry about my parents.	ASSCS
	88.	I feel guilty to leave my family and friends behind.	ASSIS, ASSCS
	89.	I feel guilty that I cannot take care of my parents.	ASSCS
	90.	I feel guilty about parental sacrifices.	Li (2006)
	91.	I feel guilty that I am living a different lifestyle here.	ASSIS
Career prospect (10)	92.	I worry about whether I will have my future career in Hong Kong.	ILS
	93.	I worry about whether I will have my future career in mainland China.	ILS
	94.	I worry about my future: will I return to mainland China or stay in Hong Kong.	ILS
	95.	I don’t want to return to mainland China, but I may have to do so.	ILS
	96.	I want to go back to mainland China, but I may not be able to do so.	ILS
	97.	I worry about my future for not being able to decide whether to stay here or to go back.	ASSIS
	98.	I worry about whether I can find a job in Hong Kong right after graduation.	Kell & Vogl (2012)
	99.	I worry about my future for not being able to decide whether to further study or look for a job after graduation.	Li (2006), Xie (2009)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	100. I worry about whether I can find a job in mainland China right after graduation.	Kell & Vogl (2012)
	101. I worry about whether my knowledge I gained in Hong Kong can be applicable in mainland China.	Cheung & Yuen (2016)
Practical life pressure (13)	102. I do not like my hostel / place of residence.	Lian & Tsang (2010)
	103. It is very difficult for me to find a value-for-money hostel / place of residence.	知多一點點 2 (2015)
	104. I am upset about my hostel / place of residence being very small.	Yuen, Cheung, & Wong (2017)
	105. The high rental of my hostel / place of residence makes me very hard to afford.	知多一點點 2 (2015), 眾新聞記者 (2018)
	106. It is inconvenient for me to commute from my hostel / place of residence to campus, since they are far apart.	眾新聞記者 (2018)
	107. I worry about my financial situation.	ILS
	108. My financial situation influences my academic study.	ILS
	109. My financial situation makes my life here very hard.	ILS
	110. Cost of living in Hong Kong is very high.	Cheung (2013), Kell & Vogl (2012)
	111. Tuition fees in Hong Kong are very high.	Cheung (2013)
	112. I worry about my physical health.	Xie (2009)
	113. I worry about my mental health.	Chui & Chan (2017)
	114. I don't like Hong Kong's weather.	Xie (2009)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 10: Chinese Affect Scale (CAS)

The English version of CAS (adapted from Hamid & Cheng, 1996, p. 1004) is as follows[18]:

1. Sad
2. Helpless
3. Frightened
4. Disappointed
5. Bitter
6. Tense
7. Insecure
8. Exhausted
9. Annoyed
10. Depressed
11. Contented
12. Exuberant
13. Excited
14. Agreeable
15. Happy
16. Meaningful
17. Joyful
18. Comfortable
19. Relaxed
20. Peaceful

The translated version of CAS in mainland Chinese (adapted and rearranged from Pan, 2008, p. 300) is as follows[19]:

1. 伤心
2. 无助
3. 害怕
4. 失望
5. 痛苦
6. 紧张
7. 不安全
8. 精疲力竭
9. 烦躁
10. 情绪低落
11. 满足
12. 活力充沛

[18] Response ranges from 1 as ‘Not at all or very slightly’, 2 as ‘Slightly’, 3 as ‘Moderately’, 4 as ‘Very’, and 5 as ‘Extremely’.

[19] 选项范围从 1 为 ‘完全没有或非常轻微’, 2 为 ‘轻微’, 3 为 ‘中等’, 4 为 ‘非常’, 5 为 ‘极度’。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

13. 兴奋
14. 惬意
15. 开心
16. 有意义
17. 喜悦
18. 舒服
19. 轻松
20. 平和

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 11: Satisfaction with Life Scale (SLS)

The English version of SLS (adapted from Diener, Emmons, Larson, & Griffin, 1985, p. 72) is as follows[20]:

21. In most ways my life is close to my ideal.
22. The conditions of my life are excellent.
23. I am satisfied with my life.
24. So far I have gotten the important things I want in life.
25. If I could live my life over, I would change almost nothing.

The translated version of SLS in mainland Chinese (adapted and rearranged from Pan, 2008, p. 309) is as follows[21]:

1. 我生活的很多方面都接近我的理想。
2. 我的生活状况非常好。
3. 我对自己的生活感到满意。
4. 到目前为止，我已拥有我想得到的重要东西。
5. 要是我可以重头活一次，我也不会对我的生活作任何改变。

[20] Response ranges from 1 as ‘Strongly disagree’ through 7 as ‘Strongly agree’.
[21] 选项范围从 1 为 ‘非常不同意’ 到 7 为 ‘非常同意’。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 12: Ethical approval letter

香港教育大學
The Education University
of Hong Kong

31 July 2017

Mr CHEUNG Kwok Wing
Doctor of Education Programme
Graduate School

Dear Mr Cheung,

Application for Ethical Review <Ref. no. 2016-2017-0289>

I am pleased to inform you that approval has been given by the Human Research Ethics Committee (HREC) for your research project:

Project title: Development and Validation of the Acculturative Stress Scale for Mainland Chinese Undergraduate Students in Hong Kong (ASSMCUS) Using Rasch Analysis

Ethical approval is granted for the project period from 31 July 2017 to 1 April 2018. If a project extension is applied for lasting more than 3 months, HREC should be contacted with information regarding the nature of and the reason for the extension. If any substantial changes have been made to the project, a new HREC application will be required.

Please note that you are responsible for informing the HREC in advance of any proposed substantive changes to the research proposal or procedures which may affect the validity of this ethical approval. You will receive separate notification should a fresh approval be required.

Thank you for your kind attention and we wish you well with your research.

Yours sincerely,

Patsy

Patsy Chung (Ms)
Secretary
Human Research Ethics Committee

c.c. Professor WANG Wen Chung, Chairperson, Human Research Ethics Committee

香港新界大埔露屏路十號
10 Lo Ping Road, Tai Po, New Territories, Hong Kong
T (852) 2948 8888 F (852) 2948 6000 www.eduhk.hk

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 13: 中国内地本科生文化适应的压力量表(ASSMCUS)

根据在香港的中国大陆本科生填写这暂定量表的数据來验证和优化这一暂定量表。 这个量表的条项描述了中国大陆本科生在香港逗留期间可能遇到的压力情况。 每个条项的选项有关于他或她面临或已遇过的压力有多大。

选项和相应的代表编号如下：

1	2	3	4	5	9
没有压力	少许压力	颇有压力	很大压力	极大压力	不适用

分量表	条项		来源
英语障碍 (17)	1.	当我需要用英语做报告时。	ASSCS
	2.	英语是课堂、研讨会、或社交场合的主要语言。	ILS
	3.	明白英语俚语。	访问
	4.	上课、参加研讨会、或在社交场合,用英语发言或表达自己的想法。	ASSCS
	5.	由于我的英语不好,无法参与课堂、研讨会或社交场合的讨论。	ASSCS
	6.	在日常生活中, 用英语跟别人沟通或聊天。	ASSCS
	7.	阅读英文材料。	ILS
	8.	观看香港英语电视台节目。	访问
	9.	收听香港英语电台节目。	访问
	10.	用英语写功课。	访问
	11.	英语作为学习及教学语言。	ILS
	12.	我的英语词汇量不足,要用的时候总觉不够用。	ASSCS
	13.	别人很难明白我说的英语。	ILS
	14.	参与英语的社交场合。	ASSCS
	15.	英语障碍给我带来弱势感。	访问
	16.	因英语障碍,我需要在学习或生活上花很多时间。	访问
	17.	我很难听懂课堂的英语讨论。	ASSCS
粤语障碍 (20)	18.	要学习粤语。	访问
	19.	我听不懂粤语。	访问
	20.	我不会说粤语。	访问

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	21.	明白粤语俚语。	访问
	22.	当我需要用粤语做报告时。	ASSCS
	23.	粤语是课堂、研讨会、或社交场合的主要语言。	ILS
	24.	上课、参加研讨会、或在社交场合,用粤语发言或表达自己的想法。	ASSCS
	25.	由于我的粤语不好,无法参与课堂、研讨会或社交场合的讨论。	ASSCS
	26.	在日常生活中,用粤语跟别人沟通或聊天。	ILS
	27.	阅读香港中文(繁体字)材料。	ILS
	28.	观看香港粤语电视台节目。	访问
	29.	收听香港粤语电台节目。	访问
	30.	用香港中文(繁体字)写功课。	访问
	31.	粤语作为学习及教学语言。	ILS
	32.	我的粤语词汇量不足,要用的时候总觉不够用。	ASSCS
	33.	别人很难明白我说的粤语。	ILS
	34.	参与粤语的社交场合。	ASSCS
	35.	粤语障碍给我带来弱势感。	访问
	36.	因粤语障碍,我需要在学习或生活上花很多时间。	访问
	37.	我很难听懂课堂的粤语讨论。	ASSCS
学习压力 (13)	38.	上课方式或老师的教学方式。	访问
	39.	香港个人化的学习方式。	访问
	40.	為了赶上学习进度,我常常要学习到很晚,甚至敖夜。	ASSCS
	41.	应付密集的学习、作业、测验和考试。	ASSCS
	42.	每天付出很长时间去学习。	访问
	43.	在学业成绩评核,要与同学竞争从而获得高等级(high grade)。	AHSCS
	44.	在学业上, 跟周围的同学比较我会有压力。	AHSCS
	45.	独立、主动及积极的学习方式。	访问
	46.	自由的学习方式。	访问
	47.	做小组作业 (group project work)。	访问

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	48.	课堂互动学习,例如小组讨论及介绍(group discussion and presentation),老师提问。	访问
	49.	跟我在内地读本科的旧同学比较,我觉得在香港读本科比较辛苦及有较多压力。	访问
	50.	在学业上，我有必须成功的压力。	ILS
文化差异 (27)	51.	我对香港的期望和实际情况的落差。	AHSCS
	52.	内地社会主义价值观和香港资本主义价值观的落差。	访问
	53.	香港人和内地人在思维方式和/或价值观上差异很大。	访问
	54.	香港人和内地人在行为习惯和/或生活方式上差异很大。	访问
	55.	在香港,按我从前在内地的学习和做事方式会有困难。	访问
	56.	香港和内地的文化差异，香港既不像内地，也不像西方已发展国家, 是个东西方文化的大熔炉, 这使我在适应上感到压力。	访问
	57.	谈论中国政治的议题。	访问
	58.	谈论人权、自由、民主、法治、廉洁、公平、国家观念。	访问
	59.	虽然我当下在香港读书，短暂离开内地，但要我疏远与内地关系，而加深与香港关系，例如毕业后在香港工作，甚或永久定居香港，我会感到有压力。	RSAFE
	60.	适应香港的文化和价值观。	AHSCS
	61.	要我不认同内地文化。	访问
	62.	要我认同或融入香港文化。	RSAFE
	63.	适应香港的作息时间,例如,睡得晚,迟起床。	访问
	64.	适应香港的食物及/或西式饮食习惯。	ILS
	65.	听香港音乐,如香港粤语流行歌曲。	ILS
	66.	日常生活要说粤语。	访问
	67.	适应粤语夹杂英语。	访问
	68.	适应在香港资本主义下受西方已发展国家影响的人权、民主、自由和法治的价值观念。	访问
	69.	适应在香港资本主义下受西方已发展国家影响的节日,例如,圣诞节和复活节。	ILS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	70.	快速的学习和生活节奏。	访问
	71.	在内地社会主义环境长大的我,要适应香港资本主义生活。	访问
	72.	因我的内地文化背景，我感到在香港社会中的地位低一点，令我不快。	ASSIS
	73.	当人们不了解我的内地文化价值观时，从而讥讽、蔑视、或敌视我,我会感到不快。	ASSIS
	74.	有些人对中港关系及政治,有着不同见解,经常争论不休,游行示威,令我感到不安。	访问
	75.	香港人对内地和/或内地人的了解很少。	访问
	76.	当其他人不理解我的文化价值时，我感到很受挫。	ASSIS
	77.	对香港社会和文化的不熟悉,使我感到不自信。	访问
社交联系 (24)	78.	与香港学生接触和交流令我感到有压力。	访问
	79.	与外国学生接触和交流令我感到有压力。	访问
	80.	与香港的内地同学接触和交往机会不多。	访问
	81.	因独自在香港生话,我感到无助。	ASSCS
	82.	当我遇到困难时，我不知道如何求助、向谁求助。	访问
	83.	在香港，我的朋友不多。	ASSCS
	84.	在香港，我难找到知己朋友倾诉心事。	RSAFE
	85.	来香港后，我的社交活动减小了。	ASSCS
	86.	要对香港有归属感。	ASSCS
	87.	要对我就读的香港高校有归属感。	访问
	88.	在香港的生活,我感到厌倦。	访问
	89.	在香港,我感到非常孤单。	ASSCS
	90.	在香港,我没有任何知己。	RSAFE
	91.	我很难融入到香港同学的生活圈子里去，因我和他们的关系都是一般的学习关系。	AHSCS
	92.	在香港,我没有新的社交网络。	AHSCS
	93.	在香港,参加香港人的社交活动。	ASSIS
	94.	在香港,参加内地人的社交活动。	ASSIS
	95.	我很难在香港发展异性关系,找到男/女朋友。	ILS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	96.	因为我的内地背景，我觉得有些人不跟我联系。	ASSCS
	97.	跟香港人交往时令我感到有压力，因我总是被孤立于他们的谈话之外。	访问
	98.	在香港,我很少有娱乐活动。	访问
	99.	我感到被困在内地人的小圈子里。	访问, Kell & Vogl (2012)
	100.	我不知道如何与不同文化背景的人交流。	访问
	101.	在香港,我的社交生活很少。	ASSCS
歧视 (19)	102.	我担忧香港人会歧视内地人。	AHSCS
	103.	我觉得有些香港人对我表示憎惡。	ASSCS
	104.	我觉得有些香港人对我有偏见。	ASSIS
	105.	我感到有些同学歧视我。	ASSIS
	106.	我觉得我的内地同学受到歧视。	ASSIS
	107.	我觉得有些人对我的内地文化背景有成见，把这些成見当成真的来对待我。	RSAFE
	108.	我觉得内地人在香港被认为是低一等的。	ASSIS
	109.	由于我的内地文化背景，我觉得有些人经常排斥我参加他们的活动。	RSAFE
	110.	由于内地同学来自不同的内地地区,我感到有些内地同学歧视我。	访问
	111.	在商店里,我感到被歧视。	ILS
	112.	在高校里,我感到被歧视。	访问
	113.	在餐馆/饭堂里,我感到被歧视。	ILS
	114.	别人讥讽我的内地文化价值。	ASSIS
	115.	在许多情况下，我觉得我被待薄。	ASSIS
	116.	因为我不是本地学生，我得不到我该得到的。如不能在校园外做兼职工作。	ASSCS
	117.	当我表达对香港或内地的政见时,我觉得有些人看不起我。	访问
	118.	因我不是香港永久居民和/或不懂粤语，我得不到很多机会,如兼职工作。	ASSCS
	119.	当他人不尊重我的文化价值时，我感到被拒绝。	访问

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	120.	因为我的文化背景，我觉得我在这个社会中的身份地位比较低。	ASSIS
乡愁和家人 (14)	121.	思乡之情困扰我。	ASSIS
	122.	我思念内地。	ASSIS
	123.	刚来香港时我很想家。	访问
	124.	与家人(和或与男/女朋友)分隔两地。	访问
	125.	我挂念家人。	访问
	126.	我想念内地朋友。	访问
	127.	空间上的距离使得我和我的男/女朋友, 这让我感到有分手机会的压力。	访问
	128.	我因离开亲友而感到伤心。	ASSIS
	129.	来香港后，我对未来的期望和家人有冲突。	RSAFE
	130.	来香港后，我有了新价值观, 但家人不了解,令我感到困扰。	RSAFE
	131.	家人对我在香港的学习有很高期望。	访问, Xie (2009)
	132.	我要努力学习，不让家人失望。	ILS
	133.	在香港读书,离开家人,我为不能照顾他们感到愧疚。	ASSCS
	134.	家人付出不少金钱来让我在香港升学,我感到内疚。	访问
职业前景 (13)	135.	我担心毕业后能否在香港发展我的职业生涯。	ILS
	136.	我担心毕业后能否在内地发展我的职业生涯。	ILS
	137.	我担心毕业后能否在国外发展我的职业生涯。	ILS
	138.	我担心我的未来：在内地、香港或国外。	ILS
	139.	我担心我的未来,因我无法决定在毕业后应是留在香港、出国外去、还是回到内地发展。	ASSIS
	140.	我担心我的未来,因我无法决定是否在毕业后继续学习或寻找工作。	访问, Li (2006), Xie (2009)

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	141. 我担心毕业后我能否在香港找到工作。	访问, Kell & Vogl (2012)
	142. 我担心毕业后我能否在内地找到工作。	访问, Kell & Vogl (2012)
	143. 我担心我在香港所学的知识能否适用于香港。	访问, Cheung & Yuen (2016)
	144. 我担心我在香港所学的知识能否适用于内地。	访问, Cheung & Yuen (2016)
	145. 我担心我在香港所学的知识能否适用于国外。	访问
	146. 我担心毕业后要回大陆工作。	访问
	147. 我担心毕业后要留在香港工作。	访问
居住压力 (8)	148. 居所的周边环境。	访问
	149. 要找到合适的居所。	访问
	150. 要找到物有所值的居所。	访问
	151. 居所的大小。	访问
	152. 居所的租金。	访问, 知多一點點 2 (2015)
	153. 居所跟校园的距离。	访问, 眾新聞記者 (2018)
	154. 和室友的相处。	访问
	155. 对我而言,香港居住条件比内地差，适应上有压力。	访问
经济压力 (7)	156. 来香港学习给我带来很大的经济压力。	访问
	157. 我的财务状况影响我的学业。	ILS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	158. 我的财务状况令我在这里的生活很艰苦。	ILS
	159. 父母支付我来香港学习的费用,使我感到我是他们的负担。	访问
	160. 我担心毕业之前失去经济资助。	ILS
	161. 香港的生活費用。	访问, Kell & Vogl (2012), Cheung (2013)
	162. 香港的高校學費。	访问, Cheung (2013)
其他生活压力 (10)	163. 我因为生活在不熟悉的环境中而感到烦恼。	访问
	164. 独立生活。	访问
	165. 独自在香港生话,平衡学业和生活是一种压力。	访问
	166. 因繁重的学业,使我的生活质量下降。	访问
	167. 时间管理得宜对我来说是一种压力。	访问
	168. 高强度的学习,我担心损害身体健康。	访问, Chui & Chan (2017)
	169. 孤单的生活,我担心我的心理健康。	访问, Chui & Chan (2017)
	170. 香港的天气。	访问, Xie (2009)
	171. 香港的空气。	访问
	172. 香港的治安、人身安全问题。	访问

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 14: Acculturative Stress Scale for Mainland Chinese Undergraduate Students (ASSMCUS)

This tentative scale is validated and optimized using the data being filled by mainland Chinese undergraduates in Hong Kong. The items of this tentative scale describe the stressful situations that a mainland Chinese undergraduate may encounter during his/her sojourn in Hong Kong. The options to each item relate to how much stress he or she is facing or has faced.

The options and corresponding representative numbers are as follows:

1	2	3	4	5	9
Not at all stressful	To a small extent stressful	Somewhat stressful	To a large extent stressful	Completely stressful	Not applicable

Subscales	Items	Sources
English barrier (17)	1. When I need to do presentations in English.	ASSCS
	2. English is the main language in classes, seminars, or social occasions.	ILS
	3. Understand English slangs.	Interview
	4. Speak in English or express my thoughts in English in classes, seminars, or social occasions.	ASSCS
	5. Because of my poor English, I can't participate in discussions in classes, seminars or social occasions.	ASSCS
	6. In daily life, communicate or chat with others in English.	ASSCS
	7. Read English materials.	ILS
	8. Watch Hong Kong's English TV programs.	Interview
	9. Listen to Hong Kong's English radio programs.	Interview
	10. Do assignments in English.	Interview
	11. English as a learning and teaching language.	ILS
	12. When I use English, my limited English vocabulary becomes a hindrance.	ASSCS
	13. It is hard for others to understand my spoken English.	ILS
	14. Participate in English speaking social occasions.	ASSCS
	15. English barrier gives me a feeling of being at a disadvantage.	Interview

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	16.	Owing to my English barrier, I need to spend more time on learning or daily life.	Interview
	17.	Understanding class discussions in English is hard for me.	ASSCS
Cantonese barrier (20)	18.	I need to learn Cantonese language.	Interview
	19.	I don’t understand Cantonese language.	Interview
	20.	I don’t speak Cantonese language.	Interview
	21.	Understand Cantonese slangs.	Interview
	22.	When I need to do presentations in traditional Chinese.	ASSCS
	23.	Cantonese is the main language in classes, seminars, or social occasions.	ILS
	24.	Speak in Cantonese or express my thoughts in Cantonese in classes, seminars, or social occasions.	ASSCS
	25.	Because of my poor Cantonese, I can't participate in discussions in classes, seminars or social occasions.	ASSCS
	26.	In daily life, communicate or chat with others in Cantonese.	ILS
	27.	Read Hong Kong Chinese (Traditional Chinese) materials.	ILS
	28.	Watch Hong Kong’s Cantonese TV programs.	Interview
	29.	Listen to Hong Kong’s Cantonese radio programs.	Interview
	30.	When I write assignments in Hong Kong Chinese (Traditional Chinese).	Interview
	31.	Cantonese as a learning and teaching language.	ILS
	32.	When I use Cantonese, my limited Cantonese vocabulary becomes a hindrance.	ASSCS
	33.	It is hard for others to understand my Cantonese.	ILS
	34.	Participate in Cantonese speaking social occasions.	ASSCS
	35.	Cantonese barrier gives me a feeling of being at a disadvantage.	Interview

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	36.	Owing to my Cantonese barrier, I need to spend more time on learning or daily life.	Interview
	37.	Understanding class discussions in Cantonese is hard for me.	ASSCS
Study stress (13)	38.	Lecture delivery or teaching methods.	Interview
	39.	Individualized learning style.	Interview
	40.	To catch up with the progress of my studies, I often have to study until the late hours of the night or even stay up late.	ASSCS
	41.	Cope with intensive study, assignments, tests and exams.	ASSCS
	42.	Spending a lot of time on my studies every day.	Interview
	43.	Competing with classmates to get a high grade in academic performance appraisal.	AHSCS
	44.	Regarding academic study, I feel pressured when making comparisons with my fellow classmates.	AHSCS
	45.	Independent, autonomous, and pro-active learning.	Interview
	46.	Freedom to learn.	Interview
	47.	Do group project work.	Interview
	48.	Interactive learning in the classroom, such as group discussion and presentation, engaging with teacher's questions in class.	Interview
	49.	Compared with my high-school classmates who are now pursuing undergraduate studies in the Mainland, I feel that studying in Hong Kong is harder and more stressful.	Interview
	50.	I have the pressure to succeed in my academic studies.	ILS
Cultural differences (27)	51.	The differences between my expectation of Hong Kong and the reality of Hong Kong.	AHSCS
	52.	The differences between the socialist values in the mainland China and the capitalist values in Hong Kong.	Interview

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

53.	Hong Kong people and mainland Chinese differ greatly in their way of thinking and/or their values.	Interview
54.	Hong Kong people and mainland Chinese differ greatly in their behaviour and/or lifestyle.	Interview
55.	In Hong Kong, I have difficulty using my previous ways of learning and doing things in mainland China.	Interview
56.	There are cultural differences between Hong Kong and the mainland China. Unlike mainland China and Western developed countries, Hong Kong is a melting pot of Eastern and Western cultures, which makes me feel stressed to adapt.	Interview
57.	Talk about topics related to politics in mainland China.	Interview
58.	Talk about human rights, freedom, democracy, the rule of law, integrity, justice, and the concept of the country.	Interview
59.	Although I am currently studying in Hong Kong and leaving the mainland China briefly, I feel stressed if I need to weaken ties with mainland China and develop close ties with Hong Kong, such as working in Hong Kong after graduation, or even permanently settling in Hong Kong.	RSAFE
60.	Adapt to Hong Kong's culture and values.	AHSCS
61.	Require me not to identify with the mainland China's culture.	Interview
62.	Require me to identify with or even integrate into Hong Kong's culture.	RSAFE
63.	Adapt to the rest time of Hong Kong, for example, sleep late, and get up late.	Interview
64.	Adapt to Hong Kong's food and/or Western eating habits in Hong Kong.	ILS
65.	Listen to Hong Kong's music, such as Hong Kong's Cantonese pop songs.	ILS
66.	Need to speak Cantonese in daily life.	Interview
67.	Hong Kong's Cantonese intermixed with English.	Interview
68.	Adapt to the values of human rights, democracy, freedom and the rule of law under	Interview

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

		Hong Kong capitalism, which were influenced by the Western developed countries.	
	69.	Adapt to festivals under Hong Kong capitalism, which were influenced by Western developed countries, such as Christmas and Easter.	ILS
	70.	Adapt to fast learning and pace of life.	Interview
	71.	As I grew up in the socialist environment in the mainland China, I need to adapt to the capitalist life in Hong Kong.	Interview
	72.	Because of my mainland Chinese cultural background, I feel that my social status in Hong Kong is a bit lower, which makes me unhappy.	ASSIS
	73.	I will be unhappy when people do not understand my cultural values in the mainland China and thus sneer at, despise, or hostile to me.	ASSIS
	74.	I am disturbed by the divergent views on mainland China-Hong Kong relations and politics, the frequent debates and demonstrations.	Interview
	75.	People of Hong Kong have limited knowledge of mainland China and/or mainland Chinese.	Interview
	76.	I feel frustrated when others do not understand my cultural values,	ASSIS
	77.	Unfamiliarity with Hong Kong's society and culture makes me feel unconfident.	Interview
Social interaction (24)	78.	I feel stressed to interact with Hong Kong students.	Interview
	79.	I feel stressed to interact with foreign students.	Interview
	80.	Opportunities for me to interact with mainland Chinese students in Hong Kong are few.	Interview
	81.	I feel helpless because I am living alone in Hong Kong.	ASSCS
	82.	When I encounter difficulties, I do not know how to ask for help and whom to ask for help.	Interview
	83.	In Hong Kong, I do not have many friends.	ASSCS
	84.	In Hong Kong, it is hard to find a close confidant I can confide in.	RSAFE

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

85.	After coming to Hong Kong, my social activities have decreased.	ASSCS
86.	Have a sense of belonging to Hong Kong.	ASSCS
87.	Have a sense of belonging to my attending tertiary institution.	Interview
88.	I feel tired of living in Hong Kong.	Interview
89.	In Hong Kong, I feel very lonely.	ASSCS
90.	In Hong Kong, I don’t have any confidants.	RSAFE
91.	It is difficult for me to integrate into the social circle of the local students in Hong Kong, because my relationship with them is just acquaintance relationship in a learning environment.	AHSCS
92.	In Hong Kong, I do not have a new social network.	AHSCS
93.	In Hong Kong, I feel intimidated to participate in social activities of local people.	ASSIS
94.	In Hong Kong, I feel intimidated to participate in social activities of mainland Chinese.	ASSIS
95.	It is difficult for me to find a soulmate to develop opposite-sex friendship and even romantic relationship in Hong Kong.	ILS
96.	Because of my mainland Chinese background, I feel that some people do not want to contact or talk to me.	ASSCS
97.	I feel stressed when I interact with Hong Kong people, because I am always isolated from their conversation.	Interview
98.	In Hong Kong, I seldom have entertainment or recreational activities.	Interview
99.	I feel trapped in a small circle of mainland Chinese.	Interview, Kell & Vogl (2012)
100.	I do not know how to interact with people from different cultures.	Interview
101.	In Hong Kong, I do not have much social life.	ASSCS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Discrimination (19)	102. I am worried about that Hong Kong people may discriminate against people from mainland China.	AHSCS
	103. I feel that some people in Hong Kong hate me.	ASSCS
	104. I feel that some people in Hong Kong are biased towards me.	ASSIS
	105. I feel that some classmates discriminate against me.	ASSIS
	106. I feel that my classmates coming from mainland China are discriminated against.	ASSIS
	107. I feel that some Hong Kong people have cultural stereotypes of mainland China and treated me as if these prejudices are true.	RSAFE
	108. I feel that people from mainland China are considered inferior in Hong Kong.	ASSIS
	109. Owing to my mainland China cultural background, I feel that some people often exclude me from participating in their activities.	RSAFE
	110. As mainland Chinese students come from different regions of mainland China, I feel that some of mainland Chinese students discriminate against me.	Interview
	111. In shops, I feel discriminated against.	ILS
	112. In tertiary institutions, I feel discriminated against.	Interview
	113. In restaurants/canteens, I feel discriminated against.	ILS
	114. My mainland China's cultural values were ridiculed.	ASSIS
	115. In many cases, I feel that I was not treated fairly.	ASSIS
	116. Because I am not a local student, I cannot get what I deserve. For example, I cannot do part-time jobs outside campus.	ASSCS
	117. When I express my views on Hong Kong or the mainland, I feel that some people look down upon me.	Interview
	118. Since I am not a permanent resident of Hong Kong and/or do not understand Cantonese, I do not have many opportunities, such as part-time work.	ASSCS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	119.	When others do not respect my cultural values, I feel rejected.	Interview
	120.	Because of my cultural background, I feel that I have a lower status in this society.	ASSIS
Homesickness and family (14)	121.	Homesickness haunts me.	ASSIS
	122.	I miss the mainland China.	ASSIS
	123.	I felt very homesick when I first came to Hong Kong.	Interview
	124.	Family (and/or boyfriend/girlfriend) and I are separated into two places.	Interview
	125.	I miss my family.	Interview
	126.	I miss my friends in the mainland China.	Interview
	127.	Long separation with my girlfriend (or boyfriend) into different places makes me feel the stress of break-up.	Interview
	128.	I feel sad about my relatives and friends I was leaving behind.	ASSIS
	129.	After coming to Hong Kong, my expectations for the future have conflicted with those of my family.	RSAFE
	130.	After coming to Hong Kong, I have developed new values which my family do not understand. Such misunderstandings bother me.	RSAFE
	131.	Family members have high expectations of my study in Hong Kong.	Interview, Xie (2009)
	132.	I will study hard and not let my family down.	ILS
	133.	Studying in Hong Kong and leaving behind my family, I feel guilty about not being able to take care of them.	ASSCS
	134.	I feel guilty about my family paying a lot of money for my study in Hong Kong.	Interview
Career prospects (13)	135.	I am worried about whether I can develop my career in Hong Kong after graduation.	ILS
	136.	I am worried about whether I can develop my career in the mainland China after graduation.	ILS

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	137. I am worried about whether I can develop my career abroad after graduation.	ILS
	138. I am worried about my future to be: in the mainland China, Hong Kong, or abroad.	ILS
	139. I am worried about my future because I cannot decide whether I should stay in Hong Kong, go abroad, or go back to the Mainland after graduation.	ASSIS
	140. I am worried about my future because I cannot decide whether to go on studying or find a job after graduation.	Interview, Li (2006), Xie (2009)
	141. I am worried about whether I can find a job in Hong Kong after graduation.	Interview, Kell & Vogl (2012)
	142. I am worried about whether I can find a job in the mainland China after graduation.	Interview, Kell & Vogl (2012)
	143. I am worried about whether the knowledge I have gained in Hong Kong can be applied in Hong Kong.	Interview, Cheung & Yuen (2016)
	144. I am worried about whether the knowledge I have gained in Hong Kong can be applied in the mainland China.	Interview, Cheung & Yuen (2016)
	145. I am worried about whether the knowledge I have gained in Hong Kong can be applied abroad.	Interview
	146. I am worried about returning to the mainland China to work after graduation.	Interview
	147. I am worried about staying in Hong Kong to work after graduation.	Interview
Accommodation (8)	148. The surroundings of the lodgings.	Interview
	149. Find right lodgings.	Interview
	150. Find value-for-money lodgings.	Interview

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

	151.	Size of lodgings.	Interview
	152.	Rent for lodgings.	Interview, 知多一點點 2 (2015)
	153.	Distance between campus and lodgings.	Interview, 眾新聞記者 (2018)
	154.	Get along with your roommate.	Interview
	155.	Living conditions in Hong Kong are worse than those in the mainland China, which is a stress for me to adapt.	Interview
Finance (7)	156.	Studying in Hong Kong has brought me great financial pressure.	Interview
	157.	My financial situation affects my studies.	ILS
	158.	My financial situation makes my life here very difficult.	ILS
	159.	My parents paid me to study in Hong Kong, which made me feel that I was their burden.	Interview
	160.	I am worried by the loss of financial support before graduation.	ILS
	161.	Living expenses in Hong Kong.	Interview, Kell & Vogl (2012), Cheung (2013)
	162.	Tuition fees for tertiary institutions in Hong Kong.	Interview, Cheung (2013)
Other life stresses (10)	163.	I am annoyed because I live in an unfamiliar environment.	Interview
	164.	Live independently.	Interview
	165.	To balance pursuing study and handling daily affairs is stressful since I am alone in Hong Kong.	Interview

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

166.	Owing to arduous studies, my quality of life has declined.	Interview
167.	Proper time management is a kind of pressure for me.	Interview
168.	In light of intensive learning, I am worried at the prospect of impairing my health.	Interview, Chui & Chan (2017)
169.	Loneliness makes me worry about my mental health.	Interview, Chui & Chan (2017)
170.	The weather in Hong Kong.	Interview, Xie (2009)
171.	The air in Hong Kong.	Interview
172.	Law and order, and personal safety in Hong Kong.	Interview

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 15: 中国内地本科生文化适应的压力量表(ASSMCUS), 最终版本

这个部分是是描述你来香港生活和学习过程中可能遇到的压力情境, 标有*的 4 个分量表, 请从下表中的 5 个选项选择一个来代表你有多大程度上正在或曾经经历过这些压力：

1	2	3	5	9
没有压力	少许压力	有压力	极大压力	不适用

其他分量表, 请从下表中的 6 个选项选择一个来代表你有多大程度上正在或曾经经历过这些压力

1	2	3	4	5	9
没有压力	少许压力	颇有压力	很大压力	极大压力	不适用

英语障碍: 不熟谙英语	
1.	我很难听懂课堂的英语讨论。
2.	英语作为学习及教学语言。
3.	用英语写功课。
4.	在日常生活中, 用英语跟别人沟通或聊天。
5.	因英语障碍,我需要在学习或生活上花很多时间。
6.	英语是课堂、研讨会、或社交场合的主要语言。
7.	当我需要用英语做报告时。
8.	我的英语词汇量不足,要用的时候总觉不够用。
9.	因我听不懂英语俚语,我感到有压力。
英语障碍: 不熟谙英语口语	
10.	别人很难明白我说的英语。
11.	由于我的英语不好,无法参与课堂、研讨会或社交场合的讨论。
12.	英语障碍给我带来弱势感。
13.	参与英语的社交场合。
14.	上课、参加研讨会、或在社交场合,用英语发言或表达自己的想法。
粤语障碍: 不熟谙粤语	
15.	我听不懂粤语。
16.	要学习粤语。
17.	因粤语障碍,我需要在学习或生活上花很多时间。
18.	我很难听懂课堂的粤语讨论。
19.	粤语作为在一门课程的学习及教学语言。
20.	我不会说粤语。
21.	粤语障碍给我带来弱势感。
22.	别人很难明白我说的粤语。
23.	粤语是课堂、研讨会、或社交场合的主要语言。
24.	在日常生活中,用粤语跟别人沟通或聊天, 我感到有压力。。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

25.	因我的粤语词汇量不足,要用的时候总觉不够用, 我感到有压力。
26.	因为我听不懂粤语俚语,我感到有压力。
粤语障碍: 不熟谙粤语口语	
27.	由于我的粤语不好,无法参与课堂、研讨会或社交场合的讨论。
28.	参与粤语的社交场合。
29.	上课、参加研讨会、或在社交场合,用粤语发言或表达自己的想法。
30.	当我需要用粤语做报告时。
学习压力: 繁重的课程	
31.	為了趕上学习进度,我常常要学习到很晚,甚至敖夜。
32.	每天付出很长时间去学习。
33.	应付密集的学习、作业、测验和考试。
34.	跟我在内地读本科的旧同学比较,我觉得在香港读本科比较辛苦及有较多压力。
35.	在学业上, 跟周围的同学比较我会有压力。
36.	在学业上，我有必须成功的压力。
学习压力: 以學生為中心的學習模式	
37.	以學生為中心的上课模式。
38.	课堂互动学习,例如小组讨论及介绍(group discussion and presentation),老师提问。
39.	做小组作业 (group project work)。
文化差异: 相互文化误解	
40.	因我的内地文化背景，我感到在香港社会中的地位低一点，令我不快。
41.	有些人对中港关系及政治,有着不同见解,经常争论不休,游行示威,令我感到不安。
42.	对香港社会和文化的不熟悉,使我感到有压力。
43.	当人们不了解我的内地文化价值观时，从而讥讽、蔑视、或敌视我,我会感到不快。
44.	当其他人不理解我的文化价值时，我感到很受挫。
45.	香港人对内地和/或内地人的了解很少。
文化差异: 认同香港文化和价值观	
46.	适应在香港资本主义下受西方已发展国家影响的节日,例如,圣诞节和复活节。
47.	适应在香港资本主义下受西方已发展国家影响的人权、民主、自由和法治的价值观念。
48.	要我认同或融入香港文化。
49.	快速的学习和生活节奏。
50.	适应粤语夹杂英语。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

51.	虽然我当下在香港读书，短暂离开内地，但要我疏远与内地关系，而加深与香港关系，例如毕业后在香港工作，甚或永久定居香港，我会感到有压力。
社交互动: 孤单	
52.	在香港,我没有任何知己。
53.	因独自在香港生活,我感到无助。
54.	在香港，我难找到知己朋友倾诉心事。
55.	在香港，我的朋友不多。
56.	在香港,我感到非常孤单。
*** 社交互动: 很难与香港人交朋友**	
57.	在香港,我的社交生活很少。
58.	跟香港人交往时令我感到有压力，因我总是被孤立于他们的谈话之外。
59.	我感到被困在内地人的小圈子里。
60.	我很难融入到香港同学的生活圈子里去，因我和他们的关系都是一般的学习关系。
61.	在香港,参加香港人的社交活动。
*** 社交互动: 有限的社交关联**	
62.	在香港,参加内地人的社交活动。
63.	因为我的内地背景，我觉得有些人不跟我联系。
64.	与香港的内地同学接触和交往机会不多。
65.	在香港,我很少有娱乐活动。
66.	在香港的生活,我感到厌倦。
67.	在香港,我没有新的社交网络。
68.	与香港学生接触和交流令我感到有压力。
69.	要对我就读的香港高校有归属感。
70.	来香港后，我的社交活动减小了。
71.	要对香港有归属感。
72.	与外国学生接触和交流令我感到有压力。
*** 歧视: 负面态度**	
73.	由于内地同学来自不同的内地地区,我感到有些内地同学歧视我。
74.	在餐馆/饭堂里,我感到被歧视。
75.	别人讥讽我的内地文化价值。
76.	在许多情况下，我觉得我被待薄。
77.	我觉得我的内地同学受到歧视。
78.	在商店里,我感到被歧视。
79.	我觉得有些香港人对我有偏见。
歧视: 感到被拒绝	

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

80.	因为我的文化背景，我觉得我在这个社会中的身份地位比较低。
81.	当他人不尊重我的文化价值时，我感到被拒绝。
82.	因为我不是本地学生，我得不到我该得到的。如不能在校园外做兼职工作。
83.	因我不是香港永久居民和/或不懂粤语，我得不到很多机会,如兼职工作。
歧视: 成见	
84.	我感到有些同学歧视我。
85.	由于我的内地文化背景，我觉得有些人经常排斥我参加他们的活动。
86.	我觉得有些香港人对我表示憎惡。
87.	我觉得有些人对我的内地文化背景有成见，把这些成見当成真的来对待我。
家庭责任	
88.	在香港读书,离开家人,我为不能照顾他们感到愧疚。
89.	家人对我在香港的学习有很高期望。
90.	我要努力学习，不让家人失望。
乡愁	
91.	我因离开亲友而感到伤心。
92.	思乡之情困扰我。
93.	我思念内地。
94.	与家人(和或与男/女朋友)分隔两地。
95.	我挂念家人。
职业前景: 知识的应用	
96.	我担心我在香港所学的知识能否适用于香港。
97.	我担心我在香港所学的知识能否适用于国外。
98.	我担心我在香港所学的知识能否适用于内地。
职业前景: 在哪里发展个人的职业生涯	
99.	我担心毕业后能否在内地发展我的职业生涯。
100.	我担心我的未来,因我无法决定在毕业后应是留在香港、出国外去、还是回到内地发展。
101.	我担心毕业后能否在香港发展我的职业生涯。
102.	我担心毕业后能否在国外发展我的职业生涯。
103.	我担心毕业后我能否在香港找到工作。
104.	我担心我的未来：在内地、香港或国外。
居住压力	
105.	居所跟校园的距离。
106.	要找到合适的居所。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

107.	对我而言,香港居住条件比内地差，适应上有压力。
108.	居所的大小。
109.	居所的租金。
经济压力	
110.	来香港学习给我带来很大的经济压力。
111.	香港的生活費用。
112.	香港的高校學費。
*** 生活压力**	
113.	独立生活。
114.	因繁重的学业,使我的生活质量下降。
115.	孤单的生活,我担心我的心理健康。
116.	我因为生活在不熟悉的环境中而感到烦恼。
117.	高强度的学习,我担心损害身体健康。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 16: Acculturative Stress Scale for Mainland Chinese Undergraduate Students (ASSMCUS) Final Version

This section is to describe the stressful situations that you may encounter in your life and study in Hong Kong. For the 4 dimensions marked with *, choose one of the 5 options in the following table to represent how much stress you are facing or have faced:

1	2	3	4	9
Not at all stressful	To a small extent stressful	Stressful	Completely stressful	Not applicable

For other dimensions, choose one of the 6 options in the following table to represent how much stress you are facing or have faced:

1	2	3	4	5	9
Not at all stressful	To a small extent stressful	Somewhat stressful	To a large extent stressful	Completely stressful	Not applicable

English Barrier: Limited English Proficiency	
1.	I feel stressed because it is hard for me to understand class discussions which are conducted in English.
2.	I feel stressed when English is used as a learning and teaching language in a course.
3.	I feel stressed when I write assignments in English.
4.	In daily life, I feel stressed when I communicate or chat with others in English.
5.	That I need to spend much time to overcome English barrier for catching up my studies or managing my daily activities bothers me.
6.	I feel stressed when English is the main language in classes, seminars, or social occasions.
7.	I feel stressed when I need to do presentation in English.
8.	I feel stressed when my limited English vocabulary hinders me from conversing well with others.
9.	That I do not know English slangs bothers me.
English Barrier: Limited Colloquial English	
10.	I feel stressed when others feel hard to understand my English during our conversation.
11.	I feel left out in class discussions, seminars or social occasions owing to the low level of my English proficiency.
12.	That English barrier could give me competitive disadvantages bothers me.
13.	I feel stressed when I participate in English social occasions.
14.	I feel stressed when I need to speak my mind in English in classes, seminars, or social occasions.
Cantonese Barrier: Limited Cantonese Proficiency	
15.	I feel stressed because I do not understand Cantonese.
16.	I feel stressed to learn Cantonese.
17.	That I need to spend much time to overcome Cantonese barrier for catching up my studies or managing my daily activities bothers me.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

18.	I feel stressed because it is hard for me to understand class discussions which are conducted in Cantonese.
19.	I feel stressed when Cantonese is a medium of instruction and of learning in a course.
20.	I feel stressed because I do not speak Cantonese.
21.	That Cantonese barrier could give me competitive disadvantages bothers me.
22.	I feel stressed when people find it difficult to understand my Cantonese during our conversation.
23.	I feel stressed when Cantonese is the main language in classes, seminars, or social occasions.
24.	In daily life, I feel stressed when I communicate or chat with other people in Cantonese.
25.	I feel stressed when my limited Cantonese vocabulary hinders me from conversing well with others.
26.	I feel stressed because I do not know Cantonese slangs.
Cantonese Barrier: Limited Colloquial Cantonese	
27.	Owing to my poor Cantonese, I feel left out when discussing in classes, seminars or social occasions.
28.	I feel stressed when I participate in Cantonese social occasions.
29.	I feel stressed when I need to make a speech in Cantonese or express my thoughts in Cantonese in classes, seminars, or social occasions.
30.	I feel stressed when I need to do presentation in Cantonese.
Study Stress: Heavy Course Load	
31.	I feel stressed because I often have to study until late night, or through the night in order to catch up on the progress of my studies,
32.	I feel stressed because I spend a lot of time on my studies every day.
33.	I feel stressed because I need to cope with intense academic learning, assignments, tests and exams.
34.	By comparison with my high-school classmates who are now pursuing undergraduate studies in mainland China, I feel that studying in Hong Kong is more demanding and stressful.
35.	I feel stressed when I compare my academic performance with those of my fellow classmates.
36.	Performing well in my studies is a pressure on me.
Study Stress: Student-Centred Learning Approach	
37.	I feel stressed when I adapt to student-centred teaching, learning and assessment approach in class.
38.	I feel stressed when I adapt to the interactive learning approach in classroom, such as group discussion, presentation, responses to teacher's questions in class.
39.	I feel stressed when I do group project work.
Cultural Difference: Mutual Cultural Misunderstanding	
40.	Because of my mainland Chinese cultural background, I feel that my social status in Hong Kong is a bit lower, which makes me unhappy.
41.	I am disturbed by the divergent views on mainland China-Hong Kong relations and politics, the frequent debates and demonstrations.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

42.	Unfamiliarity with Hong Kong's society and culture makes feel stressed.
43.	I will be unhappy when people do not understand my cultural values in the mainland China and thus sneer at, despise, or hostile to me.
44.	I feel frustrated when others do not understand my cultural values.
45.	I feel stressed when people of Hong Kong have limited knowledge of mainland China and/or mainland Chinese.
Cultural Difference: Identifying with Hong Kong's Culture and Values	
46.	I feel stressed when I adapt to festivals under Hong Kong capitalism, which were influenced by Western developed countries, such as Christmas and Easter.
47.	I feel stressed when I adapt to the values of human rights, democracy, freedom and the rule of law under Hong Kong capitalism, which were influenced by the Western developed countries.
48.	I feel stressed when I am required to identify with or even integrate into Hong Kong's culture.
49.	I feel stressed when I adapt to fast learning and pace of life.
50.	I feel stressed when I adapt to Hong Kong's Cantonese intermixed with English.
51.	Although I am currently studying in Hong Kong and away from mainland China briefly, I feel stressed if I need to weaken ties with mainland China and develop close ties with Hong Kong, such as working in Hong Kong after graduation, or even permanently settling in Hong Kong.
Social Interaction: Loneliness	
52.	In Hong Kong, I don't have any confidants.
53.	I feel helpless because I am living alone in Hong Kong.
54.	In Hong Kong, it is hard to find a close confidant I can confide in.
55.	In Hong Kong, I do not have many friends.
56.	In Hong Kong, I feel very lonely.
*** Social Interaction: Hard to Make Friends with Hong Kong People**	
57.	In Hong Kong, I do not have much social life.
58.	I feel stressed when I interact with Hong Kong people, because I am always isolated from their conversation.
59.	I feel trapped in a small circle of mainland Chinese.
60.	It is difficult for me to integrate into the social circle of the local students in Hong Kong, because my relationship with them is just acquaintance relationship in a learning environment.
61.	In Hong Kong, I feel stressed to participate in social activities of local people.
*** Social Interaction: Limited Social Connectedness**	
62.	In Hong Kong, I feel stressed to participate in social activities of mainland Chinese.
63.	Because of my mainland Chinese background, I feel that some people do not want to contact or talk to me.
64.	Opportunities for me to interact with mainland Chinese students in Hong Kong are few.
65.	In Hong Kong, I seldom have entertainment activities.
66.	I feel tired of living in Hong Kong.
67.	In Hong Kong, I do not have a new social network.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

68.	I feel stressed to interact with Hong Kong students.
69.	I feel stressed to have a sense of belonging to my attending tertiary institution.
70.	After coming to Hong Kong, my social activities have decreased.
71.	I feel stressed to have a sense of belonging to Hong Kong.
72.	I feel stressed to interact with foreign students.
*** Discrimination: Negative Attitudes**	
73.	As mainland Chinese students come from different regions of mainland China, I feel that some of mainland Chinese students discriminate against me.
74.	In restaurants/canteens, I feel discriminated against.
75.	I feel stressed when people sneer at my mainland China cultural values.
76.	In many cases, I feel that I was not treated fairly.
77.	I feel that my classmates coming from mainland China are discriminated against.
78.	In shops, I feel discriminated against.
79.	I feel that some people in Hong Kong are biased towards me.
Discrimination: Feeling Rejected	
80.	Because of my cultural background, I feel that I have a lower status in this society.
81.	When others do not respect my cultural values, I feel rejected.
82.	Because I am not a local student, I cannot get what I deserve. For example, I cannot do part-time jobs outside campus.
83.	Since I am not a permanent resident of Hong Kong and/or do not understand Cantonese, I do not have many opportunities, such as part-time work.
Discrimination: Stereotypes	
84.	I feel that some classmates discriminate against me.
85.	Owing to my mainland China cultural background, I feel that some people often exclude me from participating in their activities.
86.	I feel that some people in Hong Kong hate me.
87.	I feel that some Hong Kong people have cultural stereotypes of mainland China and treated me as if these prejudices are true.
Family Responsibilities	
88.	Studying in Hong Kong and leaving behind my family, I feel guilty about not being able to take care of them.
89.	My family members have high expectations of my studies in Hong Kong.
90.	I ought to study hard and do not let my family members be disappointed.
Homesickness	
91.	I feel sad for leaving my relatives and friends behind.
92.	Homesickness bothers me.
93.	I miss mainland China.
94.	I feel stressed that family (and/or boyfriend/girlfriend) and I are separated into two places.
95.	I miss my family.
Career Prospects: Application of Knowledge	
96.	I am worried about whether the knowledge I gained in Hong Kong can be applied in Hong Kong.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

97.	I am worried about whether the knowledge I gained in Hong Kong can be applied abroad.
98.	I am worried about whether the knowledge I gained in Hong Kong can be applied on mainland China.
Career Prospects: Where to Develop One's Career	
99.	I am worried about whether I can develop my career in mainland China after graduation.
100.	I am worried about my future because I cannot decide whether I should stay in Hong Kong, go abroad, or go back to mainland China after graduation.
101.	I am worried about whether I can develop my career in Hong Kong after graduation.
102.	I am worried about whether I can develop my career abroad after graduation.
103.	I am worried about whether I can find a job in Hong Kong after graduation.
104.	I am worried about my future to be: in mainland China, in Hong Kong, or abroad.
Accommodation	
105.	Distance between campus and lodgings bothers me.
106.	Finding right lodgings bothers me.
107.	My living conditions in Hong Kong are worse than those in mainland China, which is stressful for me to adapt.
108.	Size of lodgings bothers me.
109.	Rent for lodgings bothers me.
Finance	
110.	Studying in Hong Kong has brought me great financial pressure.
111.	Living expenses in Hong Kong bother me.
112.	Tuition fee of my attending tertiary institution bothers me.
*** Life Stress**	
113.	Living independently bothers me.
114.	I feel stressed that arduous studies undermine my quality of life.
115.	Loneliness makes me worry about my mental health.
116.	Living in an unfamiliar environment bothers me.
117.	I am worried that intense learning may impair my physical health.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 17: English Barrier's work-in-progress figures and tables

```
      Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                 -- Empirical --    Modeled
Total raw variance in observations     =         45.8 100.0%         100.0%
  Raw variance explained by measures   =         28.8  62.9%          63.1%
    Raw variance explained by persons  =         21.2  46.4%          46.6%
    Raw Variance explained by items    =          7.5  16.5%          16.5%
  Raw unexplained variance (total)     =         17.0  37.1% 100.0%   36.9%
    Unexplned variance in 1st contrast =          2.8   6.1%  16.4%
    Unexplned variance in 2nd contrast =          2.0   4.4%  11.9%
    Unexplned variance in 3rd contrast =          1.6   3.4%   9.3%
    Unexplned variance in 4th contrast =          1.3   2.8%   7.5%
    Unexplned variance in 5th contrast =          1.2   2.7%   7.2%
```

Figure 1. Standardized residual variance of the initial English Barrier dimension

```
  STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

 ---------------------------------------- ---------------------------------
|CON- |       |        INFIT OUTFIT| ENTRY    | |       |        INFIT OUTFIT| ENTRY    |
| TRAST|LOADING|MEASURE  MNSQ MNSQ |NUMBER ITE | |LOADING|MEASURE  MNSQ MNSQ |NUMBER ITE |
|------+-------+-------------------+----------| |-------+-------------------+----------|
|  1   |  .68  |   .34 1.25 1.22 |A     8 Q8  | | -.53 |   -.82  .86  .86 |a    4 Q4  |
|  1   |  .64  |   .14 1.17 1.18 |B     9 Q9  | | -.51 |   -.27  .97  .94 |b   15 Q15 |
|  1   |  .59  |   .50 1.17 1.10 |C     7 Q7  | | -.49 |   -.33  .91  .88 |c   14 Q14 |
|  1   |  .30  | -1.06  .91  .99 |D    12 Q12 | | -.44 |    .27 1.03 1.04 |d    5 Q5  |
|  1   |  .27  |   .47 1.08 1.14 |E    10 Q10 | | -.43 |    .78 1.00  .97 |e   13 Q13 |
|  1   |  .24  | -1.49 1.19 1.22 |F     3 Q3  | | -.27 |    .03  .96  .90 |f   16 Q16 |
|  1   |  .17  |   .68  .78  .78 |G    11 Q11 | | -.20 |    .31  .96  .95 |g    6 Q6  |
|      |       |                 |            | | -.11 |   -.15  .85  .84 |h    2 Q2  |
|      |       |                 |            | | -.08 |   -.55  .93  .94 |I    1 Q1  |
|      |       |                 |            | | -.07 |   1.14 1.10  .95 |H   17 Q17 |
 ---------------------------------------- ---------------------------------
```

Figure 2. Standardized residual loadings for items in the first contrast of initial English Barrier dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
         STANDARDIZED RESIDUAL CONTRAST 1 PLOT

     -2              -1               0               1               2
     -+---------------+---------------+---------------+---------------+- COUNT
   .7 +                               |    A                          + 1
      |                               | B                             | 1
   .6 +                               |       C                       + 1
      |                               |                               |
C  .5 +                               |                               +
O     |                               |                               |
N  .4 +                               |                               +
T     |                               |                               |
R  .3 +              D                |                               + 1
A     |       F                       |       E                       | 2
S  .2 +                               |                               +
T     |                               |          G                    | 1
   .1 +                               |                               +
1     |                               |                               |
   .0 +-------------------------------|-------------------------------+
L     |                               |                 H             | 1
O -.1 +                      I      h |                               + 2
A     |                               |                               |
D -.2 +                               |    g                          + 1
I     |                               f                               | 1
N -.3 +                               |                               +
G     |                               |                               |
  -.4 +                               |                               +
      |                               |   d       e                   | 2
  -.5 +                           cb  |                               + 2
      |                  a            |                               | 1
     -+---------------+---------------+---------------+---------------+-
     -2              -1               0               1               2
                                 ITEM MEASURE
COUNT:        1      1   1   1   11 1 1 1 12  2  11     1
```

Figure 3. The principal component analysis plot of item loading for the first contrast of the initial English Barrier dimension

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
7	609	274	.32	.14	1.26	2.4	1.12	.8	A .88	.89	67.1	73.4	Q7
9	573	242	-.35	.15	.92	-.7	.82	-1.2	B .89	.89	74.1	73.0	Q9
8	580	253	.04	.15	.78	-2.3	.77	-1.6	a .90	.89	82.4	73.7	Q8
MEAN	587.3	256.3	.00	.15	.98	-.2	.90	-.7			74.5	73.4	
S.D.	15.6	13.3	.27	.00	.20	1.9	.15	1.1			6.2	.3	

Figure 4. Item statistics, in misfit order, of the 3-item group 1 comprising items Q7 to Q9

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	11.1	100.0%		100.0%
Raw variance explained by measures	=	8.1	73.0%		72.7%
Raw variance explained by persons	=	7.4	66.8%		66.6%
Raw Variance explained by items	=	.7	6.2%		6.2%
Raw unexplained variance (total)	=	3.0	27.0%	100.0%	27.3%
Unexplned variance in 1st contrast	=	1.7	15.7%	58.2%	
Unexplned variance in 2nd contrast	=	1.3	11.3%	41.7%	
Unexplned variance in 3rd contrast	=	.0	.0%	.1%	
Unexplned variance in 4th contrast	=	.0	.0%	.0%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 5. Standardized residual variance of the 3-item group 1 comprising items Q7 to Q9

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	153	20	-7.15	-6.98	.87	.76	NONE	(-8.35)	1
2	2	356	46	-3.51	-3.57	1.09	1.07	-7.25	-4.00	2
3	3	165	21	.15	.24	1.02	.91	-.75	.83	3
4	4	73	9	2.90	2.92	.93	.90	2.42	4.01	4
5	5	22	3	4.87	4.63	.85	.84	5.57	(6.70)	5
MISSING		35	4	-1.07						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 6. Category structure of the 3-item group 1 comprising items Q7 to Q9

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                        +
O      |                22                                      |
B      |              222  222                                  |
A      |1           22        22                                |
B   .8 + 1          2            2                             5+
I      |  1       2               2                           5 |
L      |   1     2                 2      3333       4444     5 |
I      |    1   2                   2    3    3     4    4    5 |
T   .6 +     1 2                    2   3      3   4      4  5  +
Y      |     1 2                     2 3        3 4        4 5  |
    .5 +      *                      *          *          *    +
O      |     2 1                    32         43         54    |
F   .4 +     2 1                   3  2        4 3        5 4   +
       |    2   1                  3   2      4   3      5   4  |
R      |   2     1                3    2     4     3    5     4 |
E      |  2       1              3      2   4      3   5       4|
S   .2 + 2         1            3        2  4       3  5       4+
P      |2           1          3          *4         **         |
O      |             11      33          4 22       5  3        |
N      |               11**33         444    222 555    333     |
S   .0 +********************************************************+
E      -+------+------+------+------+------+------+------+------+-
       -9     -7     -5     -3     -1      1      3      5      7
        PERSON [MINUS] ITEM MEASURE
```

Figure 7. Category probability curves of the 3-item group 1 comprising items Q7 to Q9

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.40	.17	M	.09	.28	.31	.33	.94	129	.3509	.3171	.01	7	Q7
F	-.13	.17	M	.57	.30	-.70	.35	-2.02	114	.0453	.0250	-.44	8	Q8
F	-.26	.17	M	-.64	.30	.37	.35	1.08	109	.2846	.4319	.28	9	Q9

Figure 8. Gender DIF of the 3-item group 1 comprising items Q7 to Q9

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.38	.18	M	.47	.30	-.09	.35	-.24	125	.8073	.8658	-.27	7	Q7
F	-.38	.18	M	-.48	.33	.10	.37	.26	104	.7965	.8658	.27	9	Q9

Figure 9. Gender DIF of the 2-item group 1 comprising items Q7 and Q9

SUMMARY OF 228 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	4.7	1.9	-2.13	2.07	.79	-.5	.79	-.5
S.D.	1.5	.3	3.77	.91	1.59	1.2	1.59	1.2
MAX.	9.0	2.0	6.54	4.46	9.90	4.1	9.90	4.1
MIN.	2.0	1.0	-8.17	1.31	.00	-1.6	.00	-1.6

REAL RMSE 2.65 TRUE SD 2.67 SEPARATION 1.01 PERSON RELIABILITY .50
MODEL RMSE 2.26 TRUE SD 3.01 SEPARATION 1.33 PERSON RELIABILITY .64
S.E. OF PERSON MEAN = .25

MAXIMUM EXTREME SCORE: 4 PERSON
MINIMUM EXTREME SCORE: 42 PERSON

Figure 10. Person separation and reliability of the 2-item group 1 comprising items Q7 and Q9

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
3	806	266	-1.58	.10	1.22	2.5	1.23	2.4	A .75	.81	45.0	56.0	Q3
17	531	261	1.34	.11	1.14	1.6	.98	-.2	B .78	.77	67.3	63.1	Q17
6	626	273	.42	.11	1.08	.9	1.05	.6	C .79	.79	62.5	62.7	Q6
10	612	274	.61	.11	1.02	.3	1.07	.8	D .78	.79	67.9	62.7	Q10
16	640	263	.11	.10	1.06	.7	.98	-.2	E .82	.80	67.2	61.7	Q16
1	720	274	-.54	.10	1.01	.1	1.02	.3	d .79	.81	63.8	59.3	Q1
12	774	271	-1.11	.10	.92	-.9	.95	-.6	c .80	.81	65.5	56.9	Q12
2	674	273	-.09	.10	.90	-1.2	.89	-1.2	b .83	.80	68.2	61.4	Q2
11	590	273	.84	.11	.73	-3.2	.72	-3.1	a .85	.78	71.5	62.9	Q11
MEAN	663.7	269.8	.00	.10	1.01	.1	.99	-.1			64.3	60.7	
S.D.	83.9	4.8	.89	.00	.14	1.6	.13	1.4			7.3	2.6	

Figure 11. Item statistics, in misfit order, of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		Empirical			Modeled
Total raw variance in observations	=	26.6	100.0%		100.0%
Raw variance explained by measures	=	17.6	66.2%		66.6%
Raw variance explained by persons	=	12.8	48.3%		48.6%
Raw Variance explained by items	=	4.8	17.9%		18.0%
Raw unexplained variance (total)	=	9.0	33.8%	100.0%	33.4%
Unexplned variance in 1st contrast	=	1.8	6.9%	20.4%	
Unexplned variance in 2nd contrast	=	1.5	5.8%	17.0%	
Unexplned variance in 3rd contrast	=	1.2	4.7%	13.9%	
Unexplned variance in 4th contrast	=	1.1	4.0%	11.9%	
Unexplned variance in 5th contrast	=	1.0	3.6%	10.6%	

Figure 12. Standardized residual variance of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
3	806	266	-1.58	.10	1.22	2.5	1.23	2.4	.75	.82	45.0	56.0	Q3
10	612	274	.61	.11	1.02	.3	1.07	.8	.78	.80	67.9	62.7	Q10
1	720	274	-.54	.10	1.01	.1	1.02	.3	.79	.81	63.8	59.3	Q1
17	531	261	1.34	.11	1.14	1.6	.98	-.2	.79	.78	67.3	63.1	Q17
6	626	273	.42	.11	1.08	.9	1.05	.6	.80	.80	62.5	62.7	Q6
12	774	271	-1.11	.10	.92	-.9	.95	-.6	.80	.81	65.5	56.9	Q12
2	674	273	-.09	.10	.90	-1.2	.89	-1.2	.83	.81	68.2	61.4	Q2
16	640	263	.11	.10	1.06	.7	.98	-.2	.84	.80	67.2	61.7	Q16
11	590	273	.84	.11	.73	-3.2	.72	-3.1	.87	.79	71.5	62.9	Q11
MEAN	663.7	269.8	.00	.10	1.01	.1	.99	-.1			64.3	60.7	
S.D.	83.9	4.8	.89	.00	.14	1.6	.13	1.4			7.3	2.6	

Figure 13. Item statistics, in point-biserial correlation order, of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     420  17| -4.19 -4.09|   .96   .94||  NONE   |( -5.10)| 1
|  2   2     982  40| -2.10 -2.10|   .89   .84||   -3.97 |  -2.37 | 2
|  3   3     627  26|  -.14  -.25|   .96   .96||    -.74 |    .30 | 3
|  4   4     287  12|  1.42  1.45|  1.11  1.13||    1.41 |   2.39 | 4
|  5   5     112   5|  2.67  2.98|  1.38  1.43||    3.30 |(  4.50)| 5
|-------------------+------------+------------++---------+--------|
|MISSING       32  1| -2.81      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 14. Category structure of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                            5|
B      |1                                                        555 |
A      | 11                                                      55  |
B   .8 +   1                                                   55    +
I      |    11                                                5      |
L      |      1         222222                               5       |
I      |       1      22      2                             5        |
T   .6 +        1    2         22      33                  5         +
Y      |         1 22            2  333  33     44444   5           |
    .5 +          *               23        33 44     445            +
O      |         2 1              32          *        54            |
F   .4 +        2   1            3  2        4 3      5  4           +
       |       2     1          3   2       4   3    5    4          |
R      |      2       1        3     22    4     3  5      44        |
E      |    22         1     33        2 4       355         4       |
S   .2 +   2             11  3          *        53           44     +
P      | 22                *3         44 2      5  33           44   |
O      |2                33 111     44    22  55     33           444 |
N      |             3333     11**44      5**22       333            4|
S   .0 +***********************55*********11111********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 15. Category probability curves of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	-.45	.12	M	-.76	.20	.31	.23	1.35	156	.1788	.3560	.37	1	Q1
F	-.22	.12	M	.31	.20	-.53	.24	-2.26	154	.0250	.0911	-.13	2	Q2
F	-1.61	.11	M	-1.50	.20	-.11	.23	-.50	150	.6211	.6169	-.18	3	Q3
F	.33	.12	M	.69	.21	-.36	.24	-1.50	154	.1347	.1069	-.87	6	Q6
F	.73	.12	M	.27	.20	.46	.24	1.93	157	.0548	.1224	.55	10	Q10
F	.87	.12	M	.74	.21	.14	.24	.56	156	.5779	.4883	.26	11	Q11
F	-1.08	.11	M	-1.18	.19	.10	.23	.43	155	.6697	.8021	.03	12	Q12
F	.13	.12	M	.06	.20	.07	.24	.31	154	.7542	.5855	.05	16	Q16
F	1.34	.13	M	1.40	.22	-.06	.26	-.24	150	.8103	.9493	-.75	17	Q17

Figure 16. Gender DIF of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

SUMMARY OF 268 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	21.8	8.9	-1.33	.58	1.00	-.2	.98	-.2
S.D.	7.1	.4	2.13	.11	.78	1.5	.78	1.4
MAX.	44.0	9.0	5.70	1.09	5.94	5.0	6.04	5.1
MIN.	9.0	7.0	-6.36	.49	.16	-2.6	.14	-2.6

REAL RMSE .67 TRUE SD 2.03 SEPARATION 3.03 PERSON RELIABILITY .90
MODEL RMSE .59 TRUE SD 2.05 SEPARATION 3.45 PERSON RELIABILITY .92
S.E. OF PERSON MEAN = .13

MAXIMUM EXTREME SCORE: 2 PERSON
MINIMUM EXTREME SCORE: 4 PERSON

SUMMARY OF 9 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	663.7	269.8	.00	.10	1.01	.1	.99	-.1
S.D.	83.9	4.8	.89	.00	.14	1.6	.13	1.4
MAX.	806.0	274.0	1.34	.11	1.22	2.5	1.23	2.4
MIN.	531.0	261.0	-1.58	.10	.73	-3.2	.72	-3.1

REAL RMSE .11 TRUE SD .88 SEPARATION 8.23 ITEM RELIABILITY .99
MODEL RMSE .10 TRUE SD .88 SEPARATION 8.48 ITEM RELIABILITY .99
S.E. OF ITEM MEAN = .31

Figure 17. Separations and reliabilities of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    6             .  +
                  .  |
                     |
                     |
    5                +                                Q17 .45
                     |
                     |                                Q11 .45
                     |                                Q10 .45
    4                +                                Q6  .45
                     |                                Q16 .45
                     |                                Q2  .45
                  .  |
    3             . T+                                Q1  .45
                  .  |                      Q17 .35
                 ##  |                                Q12 .45
                 .#  |                      Q11 .35
    2            .#  +                      Q10 .35   Q3  .45
                 ##  |T                     Q6  .35
                .##  |                      Q16 .35
                 .#  |                      Q2  .35
    1            ##  +S
                ### S|                      Q1  .35
                 ##  |            Q17 .25
              .####  |                      Q12 .35
    0             #  +M           Q11 .25
               ####  |            Q10 .25   Q3  .35
                  #  |            Q6  .25
               ####  |            Q16 .25
   -1         .####  +S           Q2  .25
                    M|
              .####  |            Q1  .25
             ######  |T
   -2     .########  +            Q12 .25
                  .  |
         .#########  |            Q3  .25
               ####  |  Q17 .15
   -3             .  +
               .###  |  Q11 .15
               #### S|  Q10 .15
                     |  Q6  .15
   -4            ##  +  Q16 .15
                .##  |  Q2  .15
                     |  Q1  .15
                 .#  |
   -5                +
                  .  |  Q12 .15
                 ## T|
                     |  Q3  .15
   -6             .  +
                 .#  |
                     |
                     |
   -7            .#  +
               <less>|
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 18. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
2	10	-0.3168
3	16	-0.3165
1	11	-0.3008
3	11	-0.2776
6	10	-0.2398
12	16	-0.2311
12	17	-0.2221
1	16	-0.2207
3	17	-0.2065
2	17	-0.189
6	12	-0.1837
3	10	-0.1816
6	11	-0.1791
2	12	-0.1788
2	11	-0.1747
1	17	-0.1742
10	17	-0.1734
1	3	-0.1526
1	10	-0.1339
6	16	-0.1189
2	16	-0.1121
1	12	-0.1087
1	6	-0.1064
6	17	-0.0971
10	16	-0.0743
11	12	-0.0708
10	12	-0.0686
2	3	-0.0601
3	6	-0.0526
2	6	-0.0505
11	17	-0.0173
3	12	-0.0033
11	16	0.0017
1	2	0.1263
16	17	0.1814
10	11	0.263

Figure 19. Correlations of residuals for each item pair of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-7     -5      -3      -1       1       3       5       7
|-------+-------+-------+-------+-------+-------+-------|  NUM   ITEM
1            1   :      2     :    3   :   4    :  5    5   17  Q17
|                                                       |
1          1   :      2     :    3   :   4    :  5      5   11  Q11
1         1   :      2     :    3   :   4    :  5       5   10  Q10
1        1   :      2     :    3   :   4    :   5       5    6  Q6
1       1   :      2     :    3   :   4    :  5         5   16  Q16
1      1   :      2     :    3   :   4    :   5         5    2  Q2
|                                                       |
1    1    :     2     :    3   :   4    :   5           5    1  Q1
|                                                       |
1  1   :      2     :    3   :   4    :   5             5   12  Q12
|                                                       |
11   :      2     :    3   :   4    :   5               5    3  Q3
|-------+-------+-------+-------+-------+-------+-------|  NUM   ITEM
-7     -5      -3      -1       1       3       5       7


              11 12 211 11 1 1
4  41 62 4 76 201281584 323234696476546222         1    2  PERSON
    T        S         M        S        T
0         10  20 30 50 60 70  80  90              99      PERCENTILE
```

Figure 20. Construct keymap of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   6             .  +
                 .  |
                    |
                    |
   5                +
                    |
                    |
                    |
   4                +
                    |
                    |
                 .  |
   3             . T+
                 .  |
                ##  |
                .#  |
   2            .#  +
                ##  |T
               .##  |
                .#  |  Q17
   1            ##  +S
               ### S|  Q11
                ##  |  Q10    Q6
             .####  |
   0             #  +M Q16    Q2
              ####  |
                 #  |  Q1
              ####  |
  -1         .####  +S Q12
                   M|
             .####  |  Q3
            ######  |T
  -2     .########  +
                 .  |
        .#########  |
              ####  |
  -3             .  +
              .###  |
              #### S|
                    |
  -4            ##  +
               .##  |
                    |
                .#  |
  -5                +
                 .  |
                ## T|
                    |
  -6             .  +
                .#  |
                    |
                    |
  -7            .#  +
              <less>|<frequ>
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 21. Person-item map of the 9-item group 2 comprising items Q1 to Q3, Q6, Q10 to Q12, Q16, and Q17

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
5	605	257	.54	.12	1.11	1.2	1.11	1.2	A .87	.87	64.2	66.9	Q5
13	561	261	1.26	.13	1.04	.5	1.06	.6	B .84	.85	66.8	67.4	Q13
15	663	260	-.28	.12	.99	.0	1.00	.0	C .88	.88	65.0	66.3	Q15
4	751	274	-1.14	.12	.90	-1.2	.90	-1.2	b .89	.88	67.2	65.0	Q4
14	689	270	-.38	.12	.89	-1.2	.87	-1.5	a .89	.88	71.9	66.2	Q14
MEAN	653.8	264.4	.00	.12	.99	-.2	.99	-.2			67.0	66.3	
S.D.	66.0	6.5	.82	.00	.08	.9	.09	1.0			2.7	.8	

Figure 22. Item statistics, in misfit order, of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		Empirical			Modeled
Total raw variance in observations	=	20.0	100.0%		100.0%
Raw variance explained by measures	=	15.0	75.1%		74.7%
Raw variance explained by persons	=	13.2	66.0%		65.7%
Raw Variance explained by items	=	1.8	9.0%		9.0%
Raw unexplained variance (total)	=	5.0	24.9%	100.0%	25.3%
Unexplned variance in 1st contrast	=	1.6	7.8%	31.3%	
Unexplned variance in 2nd contrast	=	1.3	6.2%	25.0%	
Unexplned variance in 3rd contrast	=	1.2	5.8%	23.2%	
Unexplned variance in 4th contrast	=	1.0	5.1%	20.3%	
Unexplned variance in 5th contrast	=	.0	.0%	.2%	

Figure 23. Standardized residual variance of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
13	561	261	1.26	.13	1.04	.5	1.06	.6	.84	.86	66.8	67.4	Q13
14	689	270	-.38	.12	.89	-1.2	.87	-1.5	.87	.86	71.9	66.2	Q14
5	605	257	.54	.12	1.11	1.2	1.11	1.2	.87	.87	64.2	66.9	Q5
4	751	274	-1.14	.12	.90	-1.2	.90	-1.2	.87	.87	67.2	65.0	Q4
15	663	260	-.28	.12	.99	.0	1.00	.0	.90	.88	65.0	66.3	Q15
MEAN	653.8	264.4	.00	.12	.99	-.2	.99	-.2			67.0	66.3	
S.D.	66.0	6.5	.82	.00	.08	.9	.09	1.0			2.7	.8	

Figure 24. Item statistics, in point-biserial correlation order, of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	250	19	-5.51	-5.50	.99	.98	NONE	(-6.41)	1
2	2	505	38	-2.99	-2.99	.94	.96	-5.30	-3.19	2
3	3	324	25	-.06	-.04	.98	.98	-1.06	.36	3
4	4	178	13	2.44	2.37	.98	.99	1.81	3.20	4
5	5	65	5	4.02	4.14	1.12	1.11	4.55	(5.70)	5
MISSING		35	3	-3.85						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 25. Category structure of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                       55|
A      |1                                                    55  |
B   .8 + 1           22222                                  5    +
I      |  1         2     22                               5     |
L      |   1       2        2                             5      |
I      |    1     2          2     333333       44444    5       |
T   .6 +     1   2            2   3      3    4     4   5        +
Y      |      1 2              2 3        3  4       4 5         |
    .5 +       *               23          34         *          +
O      |      21               32          43         54         |
F   .4 +     2  1             3  2        4 3        5  4        +
       |    2    1           3    2      4   3      5    4       |
R      |   2      1         3      2    4     3    5      4      |
E      |  2        1       33       2  4       3  5        4     |
S   .2 + 2          1     3          24         35          4    +
P      |2            11  3           42         53           4   |
O      |               **          44  22     55  33          444|
N      |           3333  1111   444      22*55      333          |
S   .0 +***********************************1*********************+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -7      -5      -3      -1       1       3       5       7
        PERSON [MINUS] ITEM MEASURE
```

Figure 26. Category probability curves of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-1.06	.13	M	-1.38	.24	.33	.27	1.21	144	.2287	.1851	.82	4	Q4
F	.54	.14	M	.54	.24	.00	.28	.00	143	1.000	.7547	.05	5	Q5
F	1.28	.15	M	1.20	.24	.08	.28	.29	145	.7744	.4479	-.18	13	Q13
F	-.41	.14	M	-.28	.24	-.13	.27	-.48	143	.6337	.3600	.18	14	Q14
F	-.35	.14	M	-.08	.24	-.27	.28	-.98	141	.3286	.4170	-.37	15	Q15

Figure 27. Gender DIF of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

SUMMARY OF 256 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	12.2	4.9	-1.61	.89	.97	-.1	.98	-.1
S.D.	4.6	.5	3.03	.14	.78	1.2	.82	1.2
MAX.	23.0	5.0	5.17	1.57	5.05	3.3	5.02	3.3
MIN.	3.0	2.0	-6.88	.75	.03	-1.9	.03	-1.9

REAL RMSE 1.02 TRUE SD 2.85 SEPARATION 2.80 PERSON RELIABILITY .89
MODEL RMSE .90 TRUE SD 2.89 SEPARATION 3.20 PERSON RELIABILITY .91
S.E. OF PERSON MEAN = .19

MAXIMUM EXTREME SCORE: 3 PERSON
MINIMUM EXTREME SCORE: 15 PERSON

SUMMARY OF 5 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	653.8	264.4	.00	.12	.99	-.2	.99	-.2
S.D.	66.0	6.5	.82	.00	.08	.9	.09	1.0
MAX.	751.0	274.0	1.26	.13	1.11	1.2	1.11	1.2
MIN.	561.0	257.0	-1.14	.12	.89	-1.2	.87	-1.5

REAL RMSE .12 TRUE SD .81 SEPARATION 6.62 ITEM RELIABILITY .98
MODEL RMSE .12 TRUE SD .81 SEPARATION 6.72 ITEM RELIABILITY .98
S.E. OF ITEM MEAN = .41

Figure 28. Separations and reliabilities of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
   8              #  +
                     |
                     |
   7                 +
                     |
                     |
   6                 +                            Q13 .45
                     |
                  #  |                            Q5   .45
   5                 +
                     |
                  # T|                            Q14 .45
                                                  Q15 .45
   4                 +
               .###  |                            Q4   .45
                 ##  |
   3                 +                   Q13 .35
                .##  |
                     |                   Q5   .35
   2           ####  +
               .###  |T                  Q15 .35
                    S|                   Q14 .35
   1            ###  +
                     |S                  Q4   .35
           .#######  |
   0                 +M         Q13 .25
              .####  |
                     |S         Q5   .25
  -1          .####  +
                  .  |          Q15 .25
              ##### M|T         Q14 .25
  -2              #  +
            .######  |          Q4   .25
                     |
  -3              .  +
       .###########  |
                     |
  -4       ########  + Q13 .15
                  .  |
                    S| Q5   .15
  -5        .######  +
                  .  |
               ####  | Q14 .15
                       Q15 .15
  -6              .  +
                     | Q4   .15
                  .  |
  -7           ####  +
                     |
                    T|
  -8          #####  +
               <less>|
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 29. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
4	15	-0.3786
5	13	-0.3658
5	14	-0.3056
4	14	-0.2945
5	15	-0.2865
4	13	-0.249
13	15	-0.1806
13	14	-0.1779
14	15	-0.1565
4	5	-0.0838

Figure 30. Correlations of residuals for each item pair of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-8    -6     -4     -2      0      2      4      6      8
|------+------+------+------+------+------+------+------|  NUM   ITEM
1         1   :      2      :     3    :    4    :  5   5   13  Q13
|                                                       |
1      1   :       2      :    3    :    4    :   5     5    5  Q5
|                                                       |
1    1  :       2      :    3    :    4    :   5        5   15  Q15
1   1   :       2      :    3    :    4    :   5        5   14  Q14
|                                                       |
1 1  :       2      :    3    :    4    :   5           5    4  Q4
|------+------+------+------+------+------+------+------|  NUM   ITEM
-8    -6     -4     -2      0      2      4      6      8

1   1   1  2  2  3  1  1 1 1 2   1 1     1
221 21 11110 14 24  93 522 4 2 9 0 2 7 6 1  3 3     1  2   PERSON
         S           M           S           T
0   10    20 30 40 50   60  70  80  90             99       PERCENTILE
```

Figure 31. Construct keymap of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
           PERSON - MAP - ITEM
               <more>|<rare>
    8             #  +
                     |
                     |
    7                +
                     |
                     |
    6                +
                     |
                  #  |
    5                +
                     |
                  # T|
    4                +
               .###  |
                 ##  |
    3                +
                .##  |
                     |
    2          ####  +
               .###  |T
                    S|  Q13
    1           ###  +
                     |S Q5
           .#######  |
    0                +M
              .####  |  Q14     Q15
                     |S
   -1         .####  +  Q4
                  .  |
              ##### M|T
   -2             #  +
            .######  |
                     |
   -3             .  +
       .###########  |
                     |
   -4      ########  +
                  .  |
                    S|
   -5       .######  +
                  .  |
               ####  |
   -6             .  +
                     |
                  .  |
   -7          ####  +
                     |
                    T|
   -8         #####  +
               <less>|<frequ>
 EACH "#" IS 3. EACH "." IS 1 TO 2
```
Figure 32. Person-item map of the 5-item group 3 comprising items Q4, Q5, and Q13 to Q15

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 18: Cantonese Barrier's work-in-progress figures and tables

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	71.5	100.0%		100.0%
Raw variance explained by measures	=	51.5	72.0%		71.4%
Raw variance explained by persons	=	41.5	58.0%		57.5%
Raw Variance explained by items	=	10.0	14.0%		13.9%
Raw unexplained variance (total)	=	20.0	28.0%	100.0%	28.6%
Unexplned variance in 1st contrast	=	2.7	3.7%	13.4%	
Unexplned variance in 2nd contrast	=	2.0	2.8%	10.1%	
Unexplned variance in 3rd contrast	=	1.8	2.5%	8.9%	

Figure 1. Standardized residual variance of the initial Cantonese Barrier dimension

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY	NUMBER	ITE	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY	NUMBER	ITE
1	.59	1.21	1.21	1.04	A	28	Q28	-.55	-.99	.71	.63	a	24	Q24
1	.56	.63	1.05	.94	B	29	Q29	-.51	-.59	.93	1.12	b	25	Q25
1	.52	2.79	1.97	4.88	C	27	Q27	-.49	-1.42	.89	.81	c	22	Q22
1	.44	.32	2.71	3.94	D	30	Q30	-.48	-.59	.60	.60	d	34	Q34
1	.24	.24	1.02	1.23	E	18	Q18	-.33	-.58	.59	.65	e	32	Q32
1	.17	.68	.99	.93	F	19	Q19	-.28	-.35	.77	.76	f	23	Q23
1	.13	.10	.87	.80	G	31	Q31	-.26	-.12	1.12	1.06	g	35	Q35
1	.07	.19	1.06	.94	H	36	Q36	-.24	-.28	.58	.61	h	33	Q33
								-.18	-.15	.67	.71	i	20	Q20
								-.15	.20	.82	.73	j	37	Q37
								-.15	-.82	.91	.91	J	21	Q21
								-.14	-.45	.66	.63	I	26	Q26

Figure 2. Standardized residual loadings for items in the first contrast of initial Cantonese Barrier dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
      STANDARDIZED RESIDUAL CONTRAST 1 PLOT

      -2          -1           0           1           2           3
      -+-----------+-----------+-----------+-----------+-----------+- COUNT
   .6 +                        |              A                    + 1
      |                        |      B                            | 1
   .5 +                        |                                C  + 1
C     |                        |   D                               | 1
O  .4 +                        |                                   +
N     |                        |                                   |
T  .3 +                        |                                   +
R     |                        |  E                                | 1
A  .2 +                        |                                   +
S     |                        |G      F                           | 2
T  .1 +                        |                                   +
      |                        | H                                 | 1
1  .0 +------------------------|-----------------------------------+
      |                        |                                   |
L -.1 +                        |                                   +
O     |              J   I     |  j                                | 3
A -.2 +                      i |                                   + 1
D     |                    h g |                                   | 2
I -.3 +                   f    |                                   + 1
N     |                 e      |                                   | 1
G -.4 +                        |                                   +
      |                        |                                   |
  -.5 +       c        bd      |                                   + 3
      |            a           |                                   | 1
      -+-----------+-----------+-----------+-----------+-----------+-
      -2          -1           0           1           2           3
                               ITEM MEASURE
 COUNT:       1    1 1 21111 2  1121  11      1                 1
```

Figure 3. The principal component analysis plot of item loading for the first contrast of the initial Cantonese Barrier dimension

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                 -- Empirical --    Modeled
Total raw variance in observations     =         10.8 100.0%         100.0%
  Raw variance explained by measures   =          6.8  63.0%          62.9%
    Raw variance explained by persons  =          5.0  46.6%          46.5%
    Raw Variance explained by items    =          1.8  16.4%          16.4%
  Raw unexplained variance (total)     =          4.0  37.0% 100.0%   37.1%
    Unexplned variance in 1st contrast =          2.1  19.8%  53.6%
    Unexplned variance in 2nd contrast =          1.2  11.0%  29.7%
    Unexplned variance in 3rd contrast =           .6   5.9%  15.9%
    Unexplned variance in 4th contrast =           .0    .3%    .7%
    Unexplned variance in 5th contrast =           .0    .0%    .1%
```

Figure 4. Standardized residual variance of the 4-item group 1 subdimension comprising items Q27 to Q30

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER ITE		LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER ITE	
1	.87	-.93	1.61	1.50	A	30 Q30	-.81	-.07	.65	.63	a	28 Q28
1	.26	1.57	1.03	1.13	B	27 Q27	-.81	-.58	.71	.69	b	29 Q29

Figure 5. Standardized residual loadings for items in the 4-item group 1 subdimension comprising items Q27 to Q30

```
         STANDARDIZED RESIDUAL CONTRAST 1 PLOT

        -1                   0                   1                   2
        -+-------------------+-------------------+-------------------+- COUNT
     .9 +                    |                                       +
        |  A                 |                                       | 1
     .8 +                    |                                       +
        |                    |                                       |
     .7 +                    |                                       +
        |                    |                                       |
     .6 +                    |                                       +
        |                    |                                       |
     .5 +                    |                                       +
  C     |                    |                                       |
  O  .4 +                    |                                       +
  N     |                    |                                       |
  T  .3 +                    |                                       +
  R     |                    |                           B           | 1
  A  .2 +                    |                                       +
  S     |                    |                                       |
  T  .1 +                    |                                       +
        |                    |                                       |
  1  .0 +--------------------|---------------------------------------+
        |                    |                                       |
  L -.1 +                    |                                       +
  O     |                    |                                       |
  A -.2 +                    |                                       +
  D     |                    |                                       |
  I -.3 +                    |                                       +
  N     |                    |                                       |
  G -.4 +                    |                                       +
        |                    |                                       |
    -.5 +                    |                                       +
        |                    |                                       |
    -.6 +                    |                                       +
        |                    |                                       |
    -.7 +                    |                                       +
        |                    |                                       |
    -.8 +        b          a|                                       + 2
        |                    |                                       |
        -+-------------------+-------------------+-------------------+-
        -1                   0                   1                   2
                                 ITEM MEASURE
   COUNT:  1     1          1                            1
```

Figure 6. The principal component analysis plot of item loading for the 4-item group 1 subdimension comprising items Q27 to Q30

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
27	413	267	1.81	.15	1.07	.6	1.18	1.2	A .78	.80	57.3	67.9	Q27
30	545	227	-1.81	.12	.73	-2.5	.78	-1.8	a .92	.90	53.3	53.4	Q30
MEAN	479.0	247.0	.00	.14	.90	-1.0	.98	-.3			55.3	60.6	
S.D.	66.0	20.0	1.81	.01	.17	1.6	.20	1.5			2.0	7.2	

Figure 7. Item statistics, in misfit order, of the 2-item group 1A comprising items Q27 and Q30

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		Empirical			Modeled
Total raw variance in observations	=	8.8	100.0%		100.0%
Raw variance explained by measures	=	6.8	77.2%		73.7%
Raw variance explained by persons	=	2.8	32.1%		30.7%
Raw Variance explained by items	=	3.9	45.0%		43.0%
Raw unexplained variance (total)	=	2.0	22.8%	100.0%	26.3%
Unexplned variance in 1st contrast	=	.0	.5%	2.1%	
Unexplned variance in 2nd contrast	=	.0	.0%	.0%	
Unexplned variance in 3rd contrast	=	.0	.0%	.0%	
Unexplned variance in 4th contrast	=	.0	.0%	.0%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 8. Standardized residual variance of the 2-item group 1A comprising items Q27 and Q30

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	249	50	-4.31	-4.48	1.15	1.20	NONE	(-4.83)	1
2	2	129	26	-2.32	-2.08	.84	1.06	-3.72	-1.94	2
3	3	42	9	-.09	-.26	.57	.45	.00	.19	3
4	4	45	9	1.74	1.30	.72	.90	.43	1.98	4
5	5	29	6	2.58	3.25	1.26	1.37	3.29	(4.43)	5
MISSING		16	3	1.62						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 9. Category structure of the 2-item group 1A comprising items Q27 and Q30

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                             +
O      |                                                             |
B      |                                                             |
A      |                                                            5|
B   .8 +1                                                         55 +
I      | 1              222222                                  55   |
L      |  11         222      22                               5     |
I      |    1       2           2              4444444        5      |
T   .6 +     1    22             22           4       44    55       +
Y      |      1  2                 2        44          4  5         |
    .5 +       1*                   2      4             4*          +
O      |      22 1                  2     4              5 4         |
F   .4 +     2    1                  2   4              5   4        +
       |    2      1                33*3*333           5     44      |
R      |  22        11            33   *    3        55        4     |
E      | 2            1         33    4 2    33     5           44   |
S   .2 +2              11     33     4   22    33 55              44 +
P      |                 11 33     44      2    5*3                 4|
O      |                 33*11   44         2255   333               |
N      |           333333     ***11       55552222    33333          |
S   .0 +**********************55555*******11111111*******************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 10. Category probability curves of the 2-item group 1A comprising items Q27 and Q30

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	249	50	-4.91	-5.04	1.10	1.12	NONE	(-5.09)	1
2	2	129	26	-2.25	-2.00	.96	1.18	-3.97	-2.07	2
3	3	87	18	1.28	.93	.72	.66	-.15	1.99	3
5	4	29	6	3.21	3.81	1.39	1.59	4.13	(5.24)	5
MISSING		16	3	2.47						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 11. Category structure of the 2-item group 1A comprising items Q27 and Q30, after combining categories 3 and 4.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                             |
B      |1                                                            |
A      | 11                                                        55|
B   .8 +   1                                 3333333             55  +
I      |    11           2222222           33       33          5    |
L      |      1        22       2         3           3        5     |
I      |       1      2          22      3             3      5      |
T   .6 +        1   22             2   33               3    5       +
Y      |         1 2                2 3                  33 5        |
    .5 +          *                  *                     *         +
O      |         2 1                3 2                   5 3        |
F   .4 +        2   1              3   2                 5   3       +
       |       2     1            3     2               5     3      |
R      |      2       1          3       2            55       3     |
E      |    22         1        3         22         5          3    |
S   .2 +   2            11    33            2       5            33  +
P      | 22               11 3               22   55               33|
O      |2                 33*1                 ***                   |
N      |              3333    11111       55555   2222               |
S   .0 +**************5555555555555*******111111111111***************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 12. Category probability curves of the 2-item group 1A comprising items Q27 and Q30, after combining categories 3 and 4.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
27	403	267	2.16	.17	1.02	.2	1.17	1.1	A .80	.81	65.2	70.6	Q27
30	510	227	-2.16	.17	.93	-.6	.96	-.3	a .90	.90	62.0	65.8	Q30
MEAN	456.5	247.0	.00	.17	.98	-.2	1.07	.4			63.6	68.2	
S.D.	53.5	20.0	2.16	.00	.04	.4	.11	.7			1.6	2.4	

Figure 13. Item statistics, in misfit order, of the 2-item group 1A comprising items Q27 and Q30, after combining categories 3 and 4.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                              -- Empirical --    Modeled
Total raw variance in observations     =       6.7 100.0%         100.0%
  Raw variance explained by measures   =       4.7  70.1%          69.3%
    Raw variance explained by persons  =       2.3  34.1%          33.7%
    Raw Variance explained by items    =       2.4  36.0%          35.6%
  Raw unexplained variance (total)     =       2.0  29.9% 100.0%   30.7%
    Unexplned variance in 1st contrast =        .0    .7%   2.2%
    Unexplned variance in 2nd contrast =        .0    .0%    .0%
```

Figure 14. Standardized residual variance of the 2-item group 1A comprising items Q27 and Q30, after combining categories 3 and 4.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	1.92	.20	M	2.91	.36	-.99	.41	-2.41	92	.0178	.0211	-.95	27	Q27
F	-1.93	.19	M	-2.81	.33	.88	.38	2.30	84	.0239	.0211	.95	30	Q30

Figure 15. Gender DIF of the 2-item group 1A comprising items Q27 and Q30, after combining categories 3 and 4.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
29	541	238	-1.57	.23	.93	-.4	.93	-.3	A .97	.97	87.2	85.2	Q29
28	515	251	1.57	.23	.91	-.5	.89	-.6	a .97	.97	87.8	85.7	Q28

Figure 16. Item statistics, in misfit order, of the 2-item group 1B comprising items Q28 and Q29

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                              -- Empirical --    Modeled
Total raw variance in observations     =      15.2 100.0%         100.0%
  Raw variance explained by measures   =      13.2  86.8%          85.7%
    Raw variance explained by persons  =      12.0  78.7%          77.7%
    Raw Variance explained by items    =       1.2   8.1%           8.0%
  Raw unexplained variance (total)     =       2.0  13.2% 100.0%   14.3%
    Unexplned variance in 1st contrast =        .0    .0%    .0%
    Unexplned variance in 2nd contrast =        .0    .0%    .0%
```

Figure 17. Standardized residual variance of the 2-item group 1B comprising items Q28 and Q29

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     198  40|-10.56 -10.4|   .89   .90||  NONE   |(-11.43)| 1
|  2   2     130  27| -6.64 -6.69|   .90   .88|| -10.33  |  -6.81 | 2
|  3   3      77  16|  -.53  -.41|   .91   .91||  -3.29  |    .03 | 3
|  4   4      53  11|  6.37  6.17|   .83   .82||   3.35  |   6.81 | 4
|  5   5      31   6|  9.02  9.81|  1.29  1.19||  10.27  |( 11.37)| 5
|-------------------+------------+------------++---------+--------|
|MISSING       7   1| -1.71      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 18. Category structure of the 2-item group 1B comprising items Q28 and Q29

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                         +
O      |           2222            333              444          |
B      |         22     2         3    33         44    44       |
A      |1          2       2        3      3       4       4      5|
B   .8 + 1       2         2      3       3      4        4     5 +
I      | 1      2           2    3         3    4         4    5  |
L      |  1     2           2   3          3    4          4   5  |
I      |  1   2              2  3          3   4           4  5   |
T   .6 +   1 2               2 3            3 4             4 5   +
Y      |   12                 23            34              45    |
    .5 +    *                 *              *               *    +
O      |   21                 32            43              54    |
F   .4 +   2 1               3 2            4 3             5 4   +
       |  2   1              3  2          4   3           5  4   |
R      |  2    1            3   2          4    3          5    4 |
E      | 2     1            3    2        4     3         5     4 |
S   .2 + 2      1          3     2       4       3        5      4 +
P      |2        1        3       2      4        3       5      4|
O      |          1     3         22    4          3     5        |
N      |           11*33            2*44            33*55         |
S   .0 +**********************************************************+
E      -+------+------+------+------+------+------+------+------+-
      -12     -9     -6     -3      0      3      6      9     12
        PERSON [MINUS] ITEM MEASURE
```

Figure 19. Category probability curves of the 2-item group 1B comprising items Q28 and Q29

```
DIF class specification is: DIF=@GENDER

----------------------------------------------------------------------------------------------
| PERSON    DIF    DIF   PERSON    DIF    DIF      DIF    JOINT      Welch       MantelHanzl ITEM      |
| CLASS  MEASURE S.E.   CLASS  MEASURE S.E.  CONTRAST  S.E.    t  d.f. Prob.  Prob.  Size Number  Name |
|----------------------------------------------------------------------------------------------|
| F        1.44   .28   M         1.93   .43      -.50   .51  -.97   94 .3346 .4695  -.71      28  Q28 |
| F       -1.43   .28   M        -1.96   .45       .53   .53  1.00   78 .3209 .4695   .71      29  Q29 |
|----------------------------------------------------------------------------------------------|
```

Figure 20. Gender DIF of the 2-item group 1B comprising items Q28 and Q29

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 148 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	5.1	2.0	-2.59	2.08	.88	-.3	.88	-.3
S.D.	1.8	.2	5.74	.47	2.05	1.0	2.05	1.0
MAX.	9.0	2.0	10.28	4.23	9.90	3.0	9.90	3.0
MIN.	2.0	1.0	-10.34	1.84	.00	-1.6	.00	-1.6

REAL RMSE 2.66 TRUE SD 5.09 SEPARATION 1.91 PERSON RELIABILITY .79
MODEL RMSE 2.13 TRUE SD 5.33 SEPARATION 2.50 PERSON RELIABILITY .86
S.E. OF PERSON MEAN = .47

MAXIMUM EXTREME SCORE: 13 PERSON
MINIMUM EXTREME SCORE: 91 PERSON
LACKING RESPONSES: 22 PERSON

SUMMARY OF 2 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	528.0	244.5	.00	.23	.92	-.4	.91	-.5
S.D.	13.0	6.5	1.57	.00	.01	.0	.02	.1
MAX.	541.0	251.0	1.57	.23	.93	-.4	.93	-.3
MIN.	515.0	238.0	-1.57	.23	.91	-.5	.89	-.6

REAL RMSE .23 TRUE SD 1.55 SEPARATION 6.65 ITEM RELIABILITY .98
MODEL RMSE .23 TRUE SD 1.55 SEPARATION 6.65 ITEM RELIABILITY .98
S.E. OF ITEM MEAN = 1.57

Figure 21. Separations and reliabilities of the 2-item group 1B comprising items Q28 and Q29

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
  12            .#  +
                    |
  11                +
                 .  |
  10                +
                    |
   9               T+
                    |
   8                +
                    |
   7          .###  +
                    |
   6                +
                    |
   5                +
                    |
   4                +
                .#  |
   3               S+T
                    |
   2                +
                 .  |S Q28
   1                +
                    |
   0          .###  +M
                    |
  -1                +
                    |S Q29
  -2                +
                   M|
  -3                +T
                .#  |
  -4                +
                    |
  -5             .  +
                    |
  -6                +
                    |
  -7      .#######  +
                    |
  -8                +
                   S|
  -9                +
                    |
 -10                +
               .##  |
 -11                +
                    |
 -12 #############  +
              <less>|<frequ>
EACH "#" IS 7. EACH "." IS 1 TO 6
```

Figure 22. Person-item map of the 2-item group 1B comprising items Q28 and Q29

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
18	645	256	.46	.10	1.19	1.9	1.32	2.7	A .83	.85	58.4	57.4	Q18
36	582	229	.38	.11	1.32	2.8	1.17	1.4	B .84	.86	55.8	57.7	Q36
35	668	248	-.02	.10	1.26	2.5	1.15	1.4	C .85	.87	59.1	56.9	Q35
31	579	230	.25	.11	1.20	1.9	1.15	1.2	D .85	.86	60.7	57.9	Q31
19	585	249	1.03	.11	1.12	1.2	1.02	.2	E .82	.83	59.8	58.4	Q19
21	776	259	-.89	.10	1.04	.5	1.04	.4	F .87	.88	61.1	55.8	Q21
23	618	227	-.31	.11	1.01	.1	.97	-.2	f .87	.87	62.4	56.8	Q23
37	601	236	.39	.11	.94	-.6	.85	-1.4	e .87	.86	60.8	57.4	Q37
26	689	247	-.46	.10	.85	-1.6	.85	-1.4	d .89	.87	68.1	56.0	Q26
20	685	250	-.04	.10	.76	-2.7	.76	-2.5	c .89	.86	64.5	56.0	Q20
33	654	237	-.21	.11	.68	-3.6	.74	-2.6	b .90	.87	66.8	56.5	Q33
32	699	241	-.60	.10	.72	-3.2	.71	-2.9	a .91	.88	69.0	56.3	Q32
MEAN	648.4	242.4	.00	.11	1.01	-.1	.98	-.3			62.2	56.9	
S.D.	56.8	10.2	.51	.00	.21	2.2	.19	1.8			3.9	.8	

Figure 23. Item statistics, in misfit order, of the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     18  Q18                          .46    1.2  A   1.3
  RESPONSE:     1:   2   2   2   2   2    1   2   1   3   2
Z-RESIDUAL:                               X       X

  RESPONSE:    11:   1   1   3   1   1    1   1   M   1   3
Z-RESIDUAL:                      X        X   X      -2

  RESPONSE:    21:   1   5   2   1   3    5   5   1   1   2
Z-RESIDUAL:          X   X       X            X

  RESPONSE:    31:   3   M   M   4   M    2   2   M   4   4
Z-RESIDUAL:

  RESPONSE:    41:   3   4   4   1   3    3   5   2   3   2
Z-RESIDUAL:             -2       X

  RESPONSE:    51:   4   3   3   2   2    2   2   4   3   2
Z-RESIDUAL:                                  -2

  RESPONSE:    61:   3   3   M   2   3    5   3   2   5   4
Z-RESIDUAL:

  RESPONSE:    71:   2   1   2   3   4    2   4   3   2   2
Z-RESIDUAL:                     -2       -2

  RESPONSE:    81:   4   2   2   M   3    3   1   5   2   4
Z-RESIDUAL:                                  -3

  RESPONSE:    91:   3   3   3   2   M    4   5   3   2   1
Z-RESIDUAL:                                   X          -2
  RESPONSE:   101:   4   4   M   3   4    3   2   3   3   3
Z-RESIDUAL:                                       2

  RESPONSE:   111:   2   4   3   3   2    M   3   4   3   3
Z-RESIDUAL:

  RESPONSE:   121:   1   3   2   3   3    4   3   1   M   1
Z-RESIDUAL:                                      -2

  RESPONSE:   131:   1   M   M   1   1    1   1   2   1   1
Z-RESIDUAL:          X           X                    X   X

  RESPONSE:   141:   2   M   2   3   2    2   3   2   3   2
Z-RESIDUAL:

  RESPONSE:   151:   3   1   4   3   2    4   1   3   3   1
Z-RESIDUAL:              X   2                            X

  RESPONSE:   161:   1   2   2   3   5    5   2   1   M   M
Z-RESIDUAL:          X       2            2

  RESPONSE:   171:   3   2   2   3   5    4   4   1   1   2
Z-RESIDUAL:                          X

  RESPONSE:   181:   3   3   2   1   1    2   2   1   2   2
Z-RESIDUAL:                 -4      -2        2

  RESPONSE:   191:   1   3   2   1   4    1   1   2   3   1
Z-RESIDUAL:                      X        X                   X
  RESPONSE:   201:   3   3   3   1   1    3   1   2   3   5
Z-RESIDUAL:                                   X

  RESPONSE:   211:   3   5   3   5   3    3   4   1   1   2
Z-RESIDUAL:

  RESPONSE:   221:   3   4   1   4   5    1   4   2   2   1
Z-RESIDUAL:             -2                X

  RESPONSE:   231:   3   2   2   1   2    1   1   1   2   3
Z-RESIDUAL:                      X                X

  RESPONSE:   241:   1   3   2   2   5    3   4   4   5   1
Z-RESIDUAL:          X               X

  RESPONSE:   251:   4   2   3   2   3    3   5   3   3   M
Z-RESIDUAL:                      3            2

  RESPONSE:   261:   2   3   3   1   2    3   M   2   2   3
Z-RESIDUAL:                  3

  RESPONSE:   271:   1   1   3   2
Z-RESIDUAL:          X   X
```

Figure 24. Persons’ responses to item Q18 in the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
36	582	229	.39	.11	1.33	2.9	1.19	1.6	A .84	.86	55.6	57.9	Q36
35	668	248	-.01	.11	1.29	2.7	1.19	1.7	B .85	.87	58.7	57.0	Q35
31	579	230	.26	.11	1.22	2.0	1.16	1.4	C .85	.87	60.5	58.2	Q31
19	585	249	1.06	.11	1.14	1.4	1.04	.4	D .83	.83	59.9	58.7	Q19
21	776	259	-.91	.10	1.07	.8	1.08	.8	E .87	.88	60.7	56.1	Q21
18	637	252	.44	.10	1.02	.2	1.06	.6	F .85	.85	60.4	57.3	Q18
23	618	227	-.31	.11	1.02	.2	.98	-.1	f .87	.88	62.2	57.0	Q23
37	601	236	.40	.11	.95	-.5	.86	-1.3	e .87	.86	60.6	57.7	Q37
26	689	247	-.46	.10	.86	-1.4	.86	-1.3	d .89	.88	68.4	56.3	Q26
20	685	250	-.03	.10	.78	-2.4	.80	-2.0	c .89	.86	64.2	56.1	Q20
33	654	237	-.21	.11	.68	-3.5	.75	-2.4	b .90	.87	66.5	56.6	Q33
32	699	241	-.61	.11	.72	-3.0	.72	-2.8	a .91	.88	69.7	56.6	Q32
MEAN	647.8	242.1	.00	.11	1.01	-.1	.97	-.3			62.3	57.1	
S.D.	56.9	9.8	.52	.00	.21	2.1	.16	1.5			4.0	.8	

Figure 25. Item statistics, in misfit order, of the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     36  Q36                         .39     1.3   A    1.2
  RESPONSE:      1:  M   2   3   2   1    1   1   1   2   4
Z-RESIDUAL:                                X       X

  RESPONSE:     11:  1   1   5   1   2    1   1   M   3   3
Z-RESIDUAL:                       X        X   X

  RESPONSE:     21:  1   5   2   1   2    5   5   1   1   3
Z-RESIDUAL:           X   X       X            X

  RESPONSE:     31:  M   M   M   4   M    1   2   M   4   3
Z-RESIDUAL:

  RESPONSE:     41:  3   5   5   1   4    3   M   2   2   4
Z-RESIDUAL:                       X

  RESPONSE:     51:  M   3   5   2   3    2   4   3   M   1
Z-RESIDUAL:

  RESPONSE:     61:  M   2   M   1   3    5   M   M   4   4
Z-RESIDUAL:

  RESPONSE:     71:  M   M   3   5   3    5   5   M   2   2
Z-RESIDUAL:

  RESPONSE:     81:  5   3   2   M   5    4   5   1   M   4
Z-RESIDUAL:                                      -4

  RESPONSE:     91:  2   3   2   1   M    5   5   4   2   M
Z-RESIDUAL:                                    X
  RESPONSE:    101:  3   4   5   4   5    2   M   1   4   2
Z-RESIDUAL:         -3       X

  RESPONSE:    111:  2   4   2   3   M    3   M   4   M   4
Z-RESIDUAL:

  RESPONSE:    121:  M   M   2   3   4    4   3   3   M   1
Z-RESIDUAL:

  RESPONSE:    131:  M   M   M   1   1    1   1   2   1   1
Z-RESIDUAL:                       X                    X   X

  RESPONSE:    141:  1   5   M   4   M    2   4   M   2   1
Z-RESIDUAL:               X

  RESPONSE:    151:  1   1   5   4   1    3   1   4   3   1
Z-RESIDUAL:         -2   X   3                             X

  RESPONSE:    161:  1   2   1   4   5    3   2   1   M   1
Z-RESIDUAL:           X                                    X

  RESPONSE:    171:  3   1   2   5   5    2   2   1   1   2
Z-RESIDUAL:                           X   -2

  RESPONSE:    181:  4   3   M   1   2    1   1   2   2   2
Z-RESIDUAL:

  RESPONSE:    191:  2   4   2   1   2    1   1   4   1   M
Z-RESIDUAL:                       X  -2    X          -2
  RESPONSE:    201:  3   4   3   2   1    4   1   2   2   5
Z-RESIDUAL:                                    X

  RESPONSE:    211:  3   M   3   4   M    2   1   1   2   M
Z-RESIDUAL:                                   -3

  RESPONSE:    221:  3   5   1   3   5    1   4   1   3   1
Z-RESIDUAL:                                X

  RESPONSE:    231:  5   2   1   1   2    1   M   1   2   3
Z-RESIDUAL:                 -2   X                 X

  RESPONSE:    241:  1   3   1   3   5    3   M   2   5   1
Z-RESIDUAL:           X               X

  RESPONSE:    251:  2   2   2   1   3    2   4   3   M   M
Z-RESIDUAL:         -2           X

  RESPONSE:    261:  2   2   1   1   2    4   1   2   2   2
Z-RESIDUAL:                                    X

  RESPONSE:    271:  1   1   3   M
Z-RESIDUAL:           X   X
```
Figure 26. Persons' responses to item Q36 in the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
35	668	248	-.01	.11	1.34	3.2	1.30	2.6	A .85	.87	59.2	57.7	Q35
31	579	230	.27	.11	1.24	2.2	1.17	1.5	B .85	.87	61.0	58.8	Q31
19	585	249	1.09	.11	1.16	1.5	1.05	.4	C .83	.84	60.4	59.3	Q19
18	637	252	.45	.11	1.05	.5	1.11	1.0	D .85	.85	60.4	57.8	Q18
21	776	259	-.92	.10	1.08	.9	1.09	.9	E .87	.88	60.7	56.6	Q21
36	572	225	.34	.11	1.06	.6	.94	-.4	F .87	.87	56.8	58.3	Q36
23	618	227	-.32	.11	1.04	.4	1.00	.0	f .88	.88	62.7	57.5	Q23
37	601	236	.42	.11	.97	-.3	.87	-1.2	e .87	.87	60.1	58.3	Q37
26	689	247	-.47	.11	.89	-1.1	.89	-1.1	d .89	.88	68.4	56.8	Q26
20	685	250	-.03	.10	.80	-2.2	.81	-1.9	c .89	.87	65.6	56.8	Q20
33	654	237	-.21	.11	.69	-3.4	.76	-2.4	b .90	.88	67.5	57.3	Q33
32	699	241	-.62	.11	.74	-2.9	.73	-2.7	a .91	.88	69.7	57.2	Q32
MEAN	646.9	241.8	.00	.11	1.00	-.1	.98	-.3			62.7	57.7	
S.D.	57.9	10.3	.53	.00	.19	1.9	.17	1.6			3.9	.8	

Figure 27. Item statistics, in misfit order, of the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     35  Q35                        -.01      1.3   A     1.3
  RESPONSE:     1:   2   2   2   4   1    1   2   1   3   3
Z-RESIDUAL:                      3        X       X

  RESPONSE:    11:   1   1   4   1   2    1   1   M   3   3
Z-RESIDUAL:                      X        X   X

  RESPONSE:    21:   1   5   3   1   2    5   5   1   1   3
Z-RESIDUAL:          X   X       X            X

  RESPONSE:    31:   3   M   3   4   M    2   2   1   4   3
Z-RESIDUAL:                                       X

  RESPONSE:    41:   3   5   5   1   4    4   4   2   2   4
Z-RESIDUAL:                      X

  RESPONSE:    51:   M   4   5   2   3    2   5   3   M   1
Z-RESIDUAL:

  RESPONSE:    61:   M   3   M   1   4    5   3   M   5   2
Z-RESIDUAL:                                              -2

  RESPONSE:    71:   M   M   4   5   5    5   2   3   3   2
Z-RESIDUAL:                                  -3

  RESPONSE:    81:   5   3   2   1   4    2   5   1   2   5
Z-RESIDUAL:                                      -6

  RESPONSE:    91:   4   3   3   3   M    5   5   4   2   M
Z-RESIDUAL:                      2            X
  RESPONSE:   101:   5   4   5   4   5    4   2   1   3   3
Z-RESIDUAL:                  X

  RESPONSE:   111:   2   4   2   2   1    3   M   4   M   5
Z-RESIDUAL:         -2

  RESPONSE:   121:   M   2   4   3   3    5   3   1   3   1
Z-RESIDUAL:                  2                   -2

  RESPONSE:   131:   M   M   M   1   1    1   1   2   1   1
Z-RESIDUAL:                      X                    X   X

  RESPONSE:   141:   3   5   M   3   M    2   4   M   3   2
Z-RESIDUAL:              X

  RESPONSE:   151:   1   1   2   4   2    3   1   4   3   1
Z-RESIDUAL:         -2   X                                X

  RESPONSE:   161:   1   2   2   4   5    2   2   2   M   1
Z-RESIDUAL:          X       2                            X

  RESPONSE:   171:   3   2   2   5   5    4   2   1   1   1
Z-RESIDUAL:                          X

  RESPONSE:   181:   2   4   5   1   3    1   1   1   2   3
Z-RESIDUAL:         -2       X

  RESPONSE:   191:   2   4   2   1   1    1   1   4   2   M
Z-RESIDUAL:                      X  -4    X
  RESPONSE:   201:   3   3   2   1   1    4   1   2   3   5
Z-RESIDUAL:                                   X

  RESPONSE:   211:   2   5   4   4   4    3   4   2   1   2
Z-RESIDUAL:

  RESPONSE:   221:   3   5   1   3   5    1   5   1   4   2
Z-RESIDUAL:                     -2        X

  RESPONSE:   231:   5   2   4   1   2    1   2   1   2   3
Z-RESIDUAL:                      X                X

  RESPONSE:   241:   1   3   2   3   5    5   M   3   5   1
Z-RESIDUAL:          X               X

  RESPONSE:   251:   5   2   4   1   3    2   4   3   M   M
Z-RESIDUAL:                      X

  RESPONSE:   261:   2   1   2   1   3    4   1   2   2   2
Z-RESIDUAL:             -2   2                X

  RESPONSE:   271:   1   1   2   2
Z-RESIDUAL:          X   X
```

Figure 28. Persons’ responses to item Q35 in the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons’ responses to item Q18, 4 aberrant persons’ responses to item Q36

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
31	579	230	.29	.11	1.27	2.4	1.20	1.6	A .85	.88	60.8	59.3	Q31
19	585	249	1.14	.11	1.18	1.7	1.07	.6	B .83	.85	61.1	59.8	Q19
18	637	252	.48	.11	1.08	.8	1.13	1.2	C .85	.86	60.2	58.5	Q18
21	776	259	-.95	.10	1.11	1.2	1.12	1.1	D .87	.89	60.1	57.2	Q21
36	572	225	.35	.12	1.10	.9	.98	-.1	E .87	.87	56.8	58.8	Q36
23	618	227	-.32	.11	1.07	.7	1.02	.2	F .88	.88	62.7	58.1	Q23
35	660	244	-.09	.11	1.05	.5	.97	-.2	f .88	.88	59.3	58.0	Q35
37	601	236	.44	.11	.99	-.1	.89	-1.0	e .87	.87	60.4	58.9	Q37
26	689	247	-.48	.11	.92	-.8	.91	-.8	d .89	.88	68.9	57.4	Q26
20	685	250	-.02	.11	.81	-2.0	.82	-1.8	c .89	.87	64.5	57.5	Q20
33	654	237	-.21	.11	.71	-3.1	.78	-2.1	b .91	.88	67.3	57.8	Q33
32	699	241	-.63	.11	.77	-2.5	.78	-2.1	a .91	.89	69.6	57.7	Q32
MEAN	646.3	241.4	.00	.11	1.00	.0	.97	-.3			62.6	58.3	
S.D.	57.7	10.2	.55	.00	.16	1.7	.13	1.2			3.9	.8	

Figure 29. Item statistics, in misfit order, of the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' response to item Q35

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

    31  Q31                   .29    1.3  A   1.2
   RESPONSE:    1:  M  2  2  2  2   1  1  1  2  3
Z-RESIDUAL:                         X     X

   RESPONSE:   11:  1  1  M  1  2   1  1  1  4  3
Z-RESIDUAL:                  X      X  X

   RESPONSE:   21:  1  5  5  1  4   2  M  1  1  1
Z-RESIDUAL:         X  X  2  X  2  -2          -2

   RESPONSE:   31:  5  M  M  3  M   1  2  1  M  3
Z-RESIDUAL:                               X

   RESPONSE:   41:  3  5  3  1  2   3  M  2  2  4
Z-RESIDUAL:                  X

   RESPONSE:   51:  1  2  5  1  3   2  M  3  5  M
Z-RESIDUAL:        -3                        2

   RESPONSE:   61:  M  3  M  1  4   5  M  M  5  4
Z-RESIDUAL:

   RESPONSE:   71:  M  1  2  5  M   4  5  4  2  2
Z-RESIDUAL:

   RESPONSE:   81:  5  3  4  M  3   3  5  5  M  4
Z-RESIDUAL:               2               X

   RESPONSE:   91:  M  3  4  1  1   5  5  3  2  M
Z-RESIDUAL:               2     X      X
   RESPONSE:  101:  5  4  M  3  5   2  2  2  3  2
Z-RESIDUAL:

   RESPONSE:  111:  5  4  3  3  M   M  M  4  M  4
Z-RESIDUAL:         2

   RESPONSE:  121:  3  M  1  3  4   M  3  2  2  1
Z-RESIDUAL:         2

   RESPONSE:  131:  1  M  1  1  1   2  1  2  1  1
Z-RESIDUAL:         X     X  X               X  X

   RESPONSE:  141:  1  M  M  4  M   1  4  4  3  1
Z-RESIDUAL:

   RESPONSE:  151:  M  1  2  4  1   4  1  3  3  1
Z-RESIDUAL:            X                        X

   RESPONSE:  161:  1  2  1  3  4   3  1  1  M  1
Z-RESIDUAL:         X          -2               X

   RESPONSE:  171:  3  2  2  5  5   4  2  1  M  1
Z-RESIDUAL:                     X

   RESPONSE:  181:  4  4  5  1  3   2  2  1  1  1
Z-RESIDUAL:               X            2

   RESPONSE:  191:  1  2  2  1  5   1  M  2  2  1
Z-RESIDUAL:                  X      X           X
   RESPONSE:  201:  2  4  3  1  1   3  1  2  M  5
Z-RESIDUAL:                            X

   RESPONSE:  211:  2  M  2  4  M   2  4  1  2  M
Z-RESIDUAL:

   RESPONSE:  221:  M  5  1  4  4   1  3  2  4  1
Z-RESIDUAL:                         X

   RESPONSE:  231:  5  2  1  1  4   1  1  1  1  4
Z-RESIDUAL:              -2  X  2         X

   RESPONSE:  241:  1  2  M  3  5   5  M  3  5  1
Z-RESIDUAL:         X           X

   RESPONSE:  251:  3  1  4  M  1   1  4  3  1  M
Z-RESIDUAL:                    -2          -2

   RESPONSE:  261:  2  3  1  1  4   5  1  2  3  2
Z-RESIDUAL:                            X

   RESPONSE:  271:  1  1  4  2
Z-RESIDUAL:         X  X  3
```

Figure 30. Persons' responses to item Q31 in the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
19	585	249	1.15	.11	1.18	1.7	1.07	.6	A .84	.85	60.6	60.0	Q19
31	574	228	.29	.12	1.17	1.6	1.12	1.0	B .86	.88	61.5	59.6	Q31
18	637	252	.49	.11	1.09	.9	1.14	1.3	C .85	.86	61.1	58.7	Q18
21	776	259	-.95	.11	1.12	1.2	1.12	1.1	D .88	.89	60.5	57.4	Q21
36	572	225	.35	.12	1.11	1.1	.99	.0	E .87	.87	56.8	59.1	Q36
23	618	227	-.32	.11	1.10	1.0	1.06	.5	F .88	.88	62.7	58.3	Q23
35	660	244	-.09	.11	1.06	.6	.98	-.2	f .88	.88	59.3	58.2	Q35
37	601	236	.44	.11	1.00	.0	.90	-.9	e .88	.87	60.4	59.1	Q37
26	689	247	-.49	.11	.93	-.7	.92	-.7	d .89	.88	68.9	57.6	Q26
20	685	250	-.02	.11	.81	-2.1	.82	-1.8	c .89	.87	64.5	57.7	Q20
32	699	241	-.64	.11	.77	-2.4	.78	-2.1	b .91	.89	70.0	58.0	Q32
33	654	237	-.22	.11	.72	-3.1	.78	-2.1	a .91	.88	67.3	58.0	Q33
MEAN	645.8	241.3	.00	.11	1.00	.0	.97	-.3			62.8	58.5	
S.D.	58.2	10.4	.55	.00	.15	1.6	.13	1.2			3.9	.8	

Figure 31. Item statistics, in misfit order, of the 12-item group 2 comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

```
TABLE 11.1 04 Apr data.xls                      ZOU332WS.TXT  Aug  4 16:10 2018
INPUT: 274 PERSON  172 ITEM  REPORTED: 269 PERSON  12 ITEM  5 CATS WINSTEPS 3.71.0.1
--------------------------------------------------------------------------------

NO POORLY FITTING ITEM
```

Figure 32. No more poorly fitting items were shown after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	46.8	100.0%		100.0%
Raw variance explained by measures	=	34.8	74.4%		74.4%
Raw variance explained by persons	=	28.9	61.7%		61.8%
Raw Variance explained by items	=	5.9	12.7%		12.7%
Raw unexplained variance (total)	=	12.0	25.6%	100.0%	25.6%
Unexplned variance in 1st contrast	=	1.8	3.9%	15.1%	
Unexplned variance in 2nd contrast	=	1.6	3.5%	13.7%	
Unexplned variance in 3rd contrast	=	1.5	3.1%	12.3%	
Unexplned variance in 4th contrast	=	1.3	2.8%	10.9%	
Unexplned variance in 5th contrast	=	1.2	2.5%	9.8%	

Figure 33. Standardized residual variance of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
19	585	249	1.15	.11	1.18	1.7	1.07	.6	.73	.78	60.6	60.0	Q19
18	637	252	.49	.11	1.09	.9	1.14	1.3	.80	.81	61.1	58.7	Q18
21	776	259	-.95	.11	1.12	1.2	1.12	1.1	.81	.83	60.5	57.4	Q21
20	685	250	-.02	.11	.81	-2.1	.82	-1.8	.83	.82	64.5	57.7	Q20
31	574	228	.29	.12	1.17	1.6	1.12	1.0	.86	.87	61.5	59.6	Q31
35	660	244	-.09	.11	1.06	.6	.98	-.2	.86	.85	59.3	58.2	Q35
23	618	227	-.32	.11	1.10	1.0	1.06	.5	.87	.88	62.7	58.3	Q23
36	572	225	.35	.12	1.11	1.1	.99	.0	.87	.86	56.8	59.1	Q36
26	689	247	-.49	.11	.93	-.7	.92	-.7	.87	.87	68.9	57.6	Q26
37	601	236	.44	.11	1.00	.0	.90	-.9	.88	.85	60.4	59.1	Q37
32	699	241	-.64	.11	.77	-2.4	.78	-2.1	.89	.87	70.0	58.0	Q32
33	654	237	-.22	.11	.72	-3.1	.78	-2.1	.89	.86	67.3	58.0	Q33
MEAN	645.8	241.3	.00	.11	1.00	.0	.97	-.3			62.8	58.5	
S.D.	58.2	10.4	.55	.00	.15	1.6	.13	1.2			3.9	.8	

Figure 34. Item statistics, in point-biserial correlation order, of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	728	25	-4.10	-4.13	1.17	1.11	NONE	(-4.60)	1
2	2	695	24	-1.74	-1.72	1.06	.98	-3.46	-2.08	2
3	3	626	22	.16	.13	.90	.91	-.63	.22	3
4	4	476	16	1.52	1.60	1.00	.95	1.14	2.11	4
5	5	370	13	3.46	3.37	.90	.93	2.95	(4.16)	5
MISSING		262	8	-.38						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 35. Category structure of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                             +
O      |                                                             |
B      |                                                            5|
A      |                                                          55 |
B   .8 +11                                                      55   +
I      |  11                                                  55     |
L      |    1                                                5       |
I      |     1        22222222                              5        |
T   .6 +      11    22        2                            5         +
Y      |        1  2           22     3333       4444     5          |
    .5 +         *2              2  33    33   44    44455           +
O      |        2 1               *3        344        54            |
F   .4 +       2   1             3 2        433       5 44           +
       |     22     1          33   22     4   3     5     4         |
R      |    2        11       3       2  44     3   5       44       |
E      |  22           1    33         24        335          44     |
S   .2 +22              11 3           42        553            4    +
P      |                 3*1         44  22     5   33           444 |
O      |              333   11     44      22 55      33            4|
N      |         33333        *****       555*222       33333        |
S   .0 +**********************55555*******1111111********************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 36. Category probability curves of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.46	.13	M	.56	.21	-.09	.24	-.38	123	.7060	.5504	-.37	18	Q18
F	1.18	.13	M	1.08	.21	.10	.25	.41	130	.6789	.7549	.00	19	Q19
F	-.14	.12	M	.31	.21	-.45	.24	-1.86	127	.0655	.1911	-.	20	Q20
F	-.88	.12	M	-1.18	.21	.30	.24	1.26	123	.2102	.1142	+.	21	Q21
F	-.37	.13	M	-.16	.23	-.21	.26	-.79	101	.4287	.1567	-.69	23	Q23
F	-.42	.12	M	-.71	.22	.29	.25	1.13	109	.2606	.5532	-.45	26	Q26
F	.17	.13	M	.64	.23	-.47	.27	-1.78	102	.0786	.0389	-.35	31	Q31
F	-.62	.12	M	-.71	.23	.09	.26	.36	101	.7189	.7850	.00	32	Q32
F	-.24	.13	M	-.15	.22	-.09	.25	-.35	110	.7250	.2086	.00	33	Q33
F	.04	.13	M	-.48	.22	.52	.25	2.04	112	.0438	.0036	1.39	35	Q35
F	.30	.13	M	.51	.24	-.21	.27	-.76	95	.4468	.9112	.69	36	Q36
F	.49	.13	M	.32	.22	.16	.26	.63	109	.5277	.8573	+.	37	Q37

Figure 37. Gender DIF of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 229 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	30.6	10.9	-.42	.53	1.01	-.2	.98	-.2
S.D.	13.1	2.2	2.58	.17	.70	1.6	.70	1.6
MAX.	59.0	12.0	5.51	1.38	4.54	4.7	4.35	4.5
MIN.	3.0	1.0	-5.99	.40	.00	-4.0	.00	-4.0

REAL RMSE .62 TRUE SD 2.51 SEPARATION 4.06 PERSON RELIABILITY .94
MODEL RMSE .56 TRUE SD 2.52 SEPARATION 4.52 PERSON RELIABILITY .95
S.E. OF PERSON MEAN = .17

MAXIMUM EXTREME SCORE: 9 PERSON
MINIMUM EXTREME SCORE: 31 PERSON
LACKING RESPONSES: 5 PERSON
VALID RESPONSES: 90.5% (APPROXIMATE)

SUMMARY OF 12 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	645.8	241.3	.00	.11	1.00	.0	.97	-.3
S.D.	58.2	10.4	.55	.00	.15	1.6	.13	1.2
MAX.	776.0	259.0	1.15	.12	1.18	1.7	1.14	1.3
MIN.	572.0	225.0	-.95	.11	.72	-3.1	.78	-2.1

REAL RMSE .11 TRUE SD .54 SEPARATION 4.74 ITEM RELIABILITY .96
MODEL RMSE .11 TRUE SD .54 SEPARATION 4.91 ITEM RELIABILITY .96
S.E. OF ITEM MEAN = .17

Figure 38. Separations and reliabilities of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
   6             ### +
                     |
                   # |
                   . |
                     |
   5                 +
                   .T|
                     |
                     |                                    Q19 .45
                   . |
   4               . +
                   # |                                    Q18 .45
                                                          Q37 .45
                   . |                                    Q31 .45
                                                          Q36 .45
                     |
                   . |                                    Q20 .45
                                                          Q35 .45
   3               # +                                    Q23 .45
                                                          Q33 .45
                  ## |                                    Q26 .45
                   # |                                    Q32 .45
                 .## |                        Q19 .35     Q21 .45
                  ##S|
   2              .# +
                   # |
                   # |                        Q18 .35
                                              Q36 .35
                                              Q37 .35
              .#### |                         Q31 .35
                 .# |T                        Q20 .35
   1             .# +                         Q33 .35
                                              Q35 .35
                .## |                         Q23 .35
               .### |S                        Q26 .35
                                              Q32 .35
                  # |             Q19 .25
                 .# |                         Q21 .35
   0            .## +M
             .##### |
                .##M|             Q18 .25
                                  Q36 .25
                                  Q37 .25
                .## |S            Q31 .25
                  # |             Q20 .25
                                  Q35 .25
  -1              . +             Q33 .25
                .## |T            Q23 .25
                                  Q26 .25
                  # |             Q32 .25
                 ## |
                .## |             Q21 .25
  -2            .## +
                    |
                .## |  Q19 .15
                .## |
                    |
  -3              #S+
                    |  Q18 .15
                       Q36 .15
                       Q37 .15
                  # |  Q31 .15
                 .# |  Q20 .15
                       Q35 .15
                  . |  Q33 .15
  -4            .## +  Q23 .15
                       Q26 .15
                 .# |  Q32 .15
                    |
                  . |  Q21 .15
                    |
  -5              . +
                .## |
                    |
                  .T|
                    |
  -6 .############  +
              <less>|
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 39. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
21	31	-0.3312
18	37	-0.3046
26	37	-0.2841
26	35	-0.2662
21	37	-0.259
19	35	-0.2492
21	36	-0.2463
19	36	-0.239
20	23	-0.2345
19	33	-0.2314
32	36	-0.2265
18	32	-0.223
21	33	-0.217
20	31	-0.2121
31	35	-0.1918
18	33	-0.1898
23	36	-0.1762
19	23	-0.1696
18	31	-0.1595
20	32	-0.1519
19	32	-0.1499
26	36	-0.1468
23	32	-0.1365
20	37	-0.1327
23	35	-0.1315
32	35	-0.1288
19	21	-0.1273
21	35	-0.1131
20	26	-0.1114
32	37	-0.1092
33	37	-0.1047
18	26	-0.0981
20	35	-0.0956
20	33	-0.0944
18	21	-0.0748
19	26	-0.0724
20	36	-0.0701
18	20	-0.0677
23	33	-0.0599
33	35	-0.0531
18	36	-0.0527
26	31	-0.0507
21	23	-0.0492
19	31	-0.0487
23	26	-0.0442
18	23	-0.0246
33	36	-0.0192
31	36	-0.013
31	33	-0.0127
31	32	-0.0113
23	37	-0.0046
21	26	-0.0042
18	35	0.0024
23	31	0.0059
18	19	0.0388
26	32	0.0438
26	33	0.0497
21	32	0.0596
35	37	0.0647
19	20	0.0727
19	37	0.0875
36	37	0.0886
31	37	0.0949
20	21	0.1356
32	33	0.1368
35	36	0.209

Figure 40. Correlations of residuals for each item pair of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons' responses to item Q18, 4 aberrant persons' responses to item Q36, 4 aberrant persons' responses to item Q35, and editing 2 aberrant persons' responses to Q31

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-6       -4        -2         0         2         4         6
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
1            1    :      2      :    3    :   4     :    5  5   19  Q19
|                                                           |
|                                                           |
1        1    :       2     :     3   :    4     :   5      5   18  Q18
1        1    :       2     :    3    :    4     :   5      5   37  Q37
1        1    :      2      :    3    :   4     :    5      5   36  Q36
1       1    :       2     :     3   :    4     :   5       5   31  Q31
|                                                           |
1      1    :      2      :    3    :   4     :    5        5   20  Q20
1      1    :      2      :    3   :    4     :   5         5   35  Q35
1     1    :      2      :    3    :   4     :    5         5   33  Q33
1    1    :       2     :    3    :    4     :   5          5   23  Q23
1    1    :      2      :    3   :    4     :   5           5   26  Q26
1   1    :      2      :    3    :   4     :    5           5   32  Q32
|                                                           |
1 1    :       2     :    3    :    4     :   5             5   21  Q21
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
-6       -4        -2         0         2         4         6

3                            1   1   1
6 1171 2 47253 3 78 876371388685308543334673631 2312  2  1318  PERSON
        S                M                 S                T
0 10      20     30  40    50 60  70  80    90             99  PERCENTILE
```
Figure 41. Construct keymap of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons’ responses to item Q18, 4 aberrant persons’ responses to item Q36, 4 aberrant persons’ responses to item Q35, and editing 2 aberrant persons’ responses to Q31

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
              PERSON - MAP - ITEM
                  <more>|<rare>
    6           ###  +
                     |
                  #  |
                  .  |
                     |
    5                +
                  . T|
                     |
                     |
                  .  |
    4             .  +
                  #  |
                  .  |
                     |
                  .  |
    3             #  +
                 ##  |
                  #  |
                .##  |
                 ## S|
    2            .#  +
                  #  |
                  #  |
             .####   |
                 .#  |T Q19
    1            .#  +
                .##  |
               .###  |S
                  #  |  Q18    Q36    Q37
                 .#  |  Q31
    0           .##  +M Q20    Q35
             .#####  |  Q33
                .## M|  Q23    Q26
                .##  |S Q32
                  #  |
   -1             .  +  Q21
                .##  |T
                  #  |
                 ##  |
                .##  |
   -2           .##  +
                     |
                .##  |
                .##  |
                     |
   -3             # S+
                     |
                  #  |
                 .#  |
                  .  |
   -4           .##  +
                 .#  |
                     |
                  .  |
                     |
   -5             .  +
                .##  |
                     |
                  . T|
                     |
   -6 .############  +
                  <less>|<frequ>
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 42. Person-item map of the 12-item group 2 subdimension comprising items Q18 to Q21, Q23, Q26, Q31 to Q33, and Q35 to Q37, after editing 4 aberrant persons’ responses to item Q18, 4 aberrant persons’ responses to item Q36, 4 aberrant persons’ responses to item Q35, and editing 2 aberrant persons’ responses to Q31

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
34	712	245	.85	.14	1.27	2.4	1.26	2.2	A .93	.94	66.5	65.8	Q34
25	656	226	.64	.15	.98	-.1	.89	-.9	B .95	.94	75.5	65.6	Q25
22	670	212	-1.21	.16	.98	-.1	.96	-.2	b .95	.95	74.2	66.3	Q22
24	693	228	-.28	.15	.68	-3.2	.68	-3.1	a .96	.95	80.5	67.0	Q24
MEAN	682.8	227.8	.00	.15	.98	-.3	.95	-.5			74.1	66.2	
S.D.	21.4	11.7	.82	.00	.21	2.0	.21	1.9			5.0	.5	

Figure 43. Item statistics, in misfit order, of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     34  Q34                       .85       1.3  A      1.3
  RESPONSE:      1:  M   2   3   3   2    1   1   1   3   3
Z-RESIDUAL:                      3        X       X

  RESPONSE:     11:  1   1   4   1   3    1   1   1   3   3
Z-RESIDUAL:                      X  -2    X   X

  RESPONSE:     21:  1   5   3   1   3    5   5   1   1   3
Z-RESIDUAL:          X   X  -2   X        X   X   X   X

  RESPONSE:     31:  3   M   M   4   M    2   2   1   4   3
Z-RESIDUAL:                                       X

  RESPONSE:     41:  3   5   3   1   4    3   5   1   4   4
Z-RESIDUAL:              X       X            X

  RESPONSE:     51:  4   4   5   3   3    2   5   4   M   3
Z-RESIDUAL:          3       X                X

  RESPONSE:     61:  M   4   M   2   4    5   3   M   5   4
Z-RESIDUAL:                               X

  RESPONSE:     71:  M   2   4   5   5    5   M   5   2   2
Z-RESIDUAL:              2       X   X    X       X

  RESPONSE:     81:  5   3   2   3   5    3   5   5   3   5
Z-RESIDUAL:          X      -2       X        X   X

  RESPONSE:     91:  3   3   3   1   M    5   5   4   2   M
Z-RESIDUAL:                               X   X
  RESPONSE:    101:  5   4   5   3   5    4   M   1   3   3
Z-RESIDUAL:          X       X       X

  RESPONSE:    111:  5   4   3   3   2    4   M   4   M   4
Z-RESIDUAL:          X

  RESPONSE:    121:  M   4   3   3   5    M   3   3   2   1
Z-RESIDUAL:                  2                   -2

  RESPONSE:    131:  M   M   M   1   1    2   1   2   1   1
Z-RESIDUAL:                      X   X                X   X

  RESPONSE:    141:  1   5   M   5   M    2   4   M   3   3
Z-RESIDUAL:         -3   X                                2

  RESPONSE:    151:  M   1   2   4   3    3   1   4   4   1
Z-RESIDUAL:              X                                X

  RESPONSE:    161:  1   3   1   4   5    3   2   2   M   1
Z-RESIDUAL:          X               X                    X

  RESPONSE:    171:  3   2   2   5   5    4   2   1   2   1
Z-RESIDUAL:                      X           -2   X  -2

  RESPONSE:    181:  4   4   5   1   5    2   1   1   2   2
Z-RESIDUAL:                  X                X

  RESPONSE:    191:  2   4   2   1   3    1   2   4   3   1
Z-RESIDUAL:                      X        X
  RESPONSE:    201:  2   4   4   1   1    4   1   2   3   4
Z-RESIDUAL:                          X        X

  RESPONSE:    211:  2   5   3   4   4    2   5   2   1   4
Z-RESIDUAL:              X                    X

  RESPONSE:    221:  3   5   3   4   5    1   4   1   4   2
Z-RESIDUAL:              X  -2       X    X

  RESPONSE:    231:  3   2   3   1   3    1   M   1   4   4
Z-RESIDUAL:                 -2   X                X

  RESPONSE:    241:  1   3   M   3   5    5   4   3   5   1
Z-RESIDUAL:          X               X    X           X

  RESPONSE:    251:  5   3   5   1   3    2   4   3   2   M
Z-RESIDUAL:          X   2       X

  RESPONSE:    261:  2   3   1   1   5    5   1   2   2   3
Z-RESIDUAL:                      X        X   X

  RESPONSE:    271:  1   1   2   M
Z-RESIDUAL:          X   X
```

Figure 44. Persons’ responses to item Q34 in the 4 item group 3 comprising items Q22, Q24, Q25, and Q34

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        ITEM STATISTICS:  MISFIT ORDER

-------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|      |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM |
|------------------------------------+----------+----------+-----------+-----------+------|
|    34    704    242      .95    .15|1.18   1.6|1.13   1.1|A .94   .94| 67.6  67.4| Q34  |
|    25    656    226      .68    .15|1.06    .6| .96   -.3|B .94   .95| 74.7  67.2| Q25  |
|    22    670    212    -1.31    .16| .99    .0|1.00    .0|b .95   .95| 78.0  68.0| Q22  |
|    24    693    228     -.32    .16| .69  -3.1| .69  -2.8|a .97   .95| 80.4  68.8| Q24  |
|------------------------------------+----------+----------+-----------+-----------+------|
| MEAN   680.8  227.0      .00    .16| .98   -.2| .95   -.5|           | 75.2  67.9|      |
| S.D.    18.8   10.6      .89    .00| .18   1.8| .16   1.4|           |  4.8    .6|      |
-------------------------------------------------------------------------------------------
```

Figure 45. Item statistics, in misfit order, of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

```
TABLE 11.1 04 Apr data.xls                        ZOU737WS.TXT  Aug  5  8:45 2018
INPUT: 274 PERSON  172 ITEM  REPORTED: 257 PERSON  4 ITEM  5 CATS WINSTEPS 3.71.0.1
------------------------------------------------------------------------------------

NO POORLY FITTING ITEM
```

Figure 46. No more poorly fitting items were shown after editing 3 aberrant persons' responses to item Q34

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                   -- Empirical --    Modeled
Total raw variance in observations      =          22.4 100.0%         100.0%
  Raw variance explained by measures    =          18.4  82.2%          81.9%
    Raw variance explained by persons   =          17.1  76.3%          76.0%
    Raw Variance explained by items     =           1.3   5.9%           5.9%
  Raw unexplained variance (total)      =           4.0  17.8% 100.0%   18.1%
    Unexplned variance in 1st contrast =            1.6   7.0%  39.3%
    Unexplned variance in 2nd contrast =            1.4   6.3%  35.1%
    Unexplned variance in 3rd contrast =            1.0   4.5%  25.3%
    Unexplned variance in 4th contrast =             .0    .1%    .4%
    Unexplned variance in 5th contrast =             .0    .0%    .0%
```

Figure 47. Standardized residual variance of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

```
        ITEM STATISTICS:  CORRELATION ORDER

-------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PTBISERL-AL|EXACT MATCH|      |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM |
|------------------------------------+----------+----------+-----------+-----------+------|
|    34    704    242      .95    .15|1.18   1.6|1.13   1.1|  .78   .78| 67.6  67.4| Q34  |
|    25    656    226      .68    .15|1.06    .6| .96   -.3|  .90   .90| 74.7  67.2| Q25  |
|    22    670    212    -1.31    .16| .99    .0|1.00    .0|  .91   .92| 78.0  68.0| Q22  |
|    24    693    228     -.32    .16| .69  -3.1| .69  -2.8|  .93   .92| 80.4  68.8| Q24  |
|------------------------------------+----------+----------+-----------+-----------+------|
| MEAN   680.8  227.0      .00    .16| .98   -.2| .95   -.5|           | 75.2  67.9|      |
| S.D.    18.8   10.6      .89    .00| .18   1.8| .16   1.4|           |  4.8    .6|      |
-------------------------------------------------------------------------------------------
```

Figure 48. Item statistics, in point-biserial correlation order, of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     203  22| -7.09 -6.96|  1.05   .87||  NONE   |( -7.52)| 1
|  2   2     165  18| -3.15 -3.32|  1.12  1.02||   -6.42 |  -3.74 | 2
|  3   3     171  19|   .58   .78|   .93   .93||   -1.06 |    .53 | 3
|  4   4     168  19|  3.48  3.40|   .85   .88||    2.13 |   3.74 | 4
|  5   5     201  22|  5.79  5.78|  1.03  1.04||    5.35 |(  6.47)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      80   8|   .86      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 49. Category structure of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                  |      +
O      |                                                        5|
B      |              22                                      55 |
A      |1           22  222                                  5   |
B   .8 + 1         2       2                                5    +
I      |  1       2         2                              5     |
L      |  1      2           2      3333       44444      5      |
I      |   1    2             2    3    33    4     4    5       |
T   .6 +    1  2               2  3      3   4       4  5        +
Y      |     12                2 3        3 4         45         |
    .5 +     *                  *          34         45         +
O      |     21                 32         43         54         |
F   .4 +    2  1               3 2        4 3        5  4        +
       |   2    1             3   2      4   3       5   4       |
R      |  2     1            3     2     4    3     5     4      |
E      |  2      1          3       2   4      3   5       4     |
S   .2 + 2        1        33        2 4        3 5         4    +
P      |2          11     3           *          *           4   |
O      |             11 33          44 2        5 33          44 |
N      |            333*11       444    222  555    333         4|
S   .0 +*********************************************************+
E      -+------+------+------+------+------+------+------+------+-
       -8     -6     -4     -2      0      2      4      6      8
        PERSON [MINUS] ITEM MEASURE
```

Figure 50. Category probability curves of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-1.31	.19	M	-1.36	.35	.05	.39	.13	69	.9009	.9475	-.13	22	Q22
F	-.37	.17	M	-.11	.35	-.26	.39	-.66	67	.5115	.8860	.69	24	Q24
F	.76	.17	M	.36	.34	.39	.38	1.02	68	.3091	.5624	-.48	25	Q25
F	.91	.17	M	1.11	.34	-.20	.38	-.52	69	.6048	.4437	-.09	34	Q34

Figure 51. Gender DIF of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

SUMMARY OF 182 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	10.9	3.6	.37	1.13	.92	-.3	.92	-.3
S.D.	4.7	.8	4.11	.32	1.13	1.3	1.16	1.2
MAX.	19.0	4.0	6.68	2.87	6.74	4.0	6.65	4.0
MIN.	2.0	1.0	-7.70	.90	.00	-1.6	.00	-1.7

REAL RMSE 1.33 TRUE SD 3.89 SEPARATION 2.93 PERSON RELIABILITY .90
MODEL RMSE 1.17 TRUE SD 3.94 SEPARATION 3.37 PERSON RELIABILITY .92
S.E. OF PERSON MEAN = .31

MAXIMUM EXTREME SCORE: 37 PERSON
MINIMUM EXTREME SCORE: 38 PERSON
LACKING RESPONSES: 17 PERSON

SUMMARY OF 4 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	680.8	227.0	.00	.16	.98	-.2	.95	-.5
S.D.	18.8	10.6	.89	.00	.18	1.8	.16	1.4
MAX.	704.0	242.0	.95	.16	1.18	1.6	1.13	1.1
MIN.	656.0	212.0	-1.31	.15	.69	-3.1	.69	-2.8

REAL RMSE .16 TRUE SD .87 SEPARATION 5.45 ITEM RELIABILITY .97
MODEL RMSE .16 TRUE SD .88 SEPARATION 5.61 ITEM RELIABILITY .97
S.E. OF ITEM MEAN = .51

Figure 52. Separations and reliabilities of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    7 .############  +
               .###  |
                  #  |                             Q34 .45
                  .  |
    6                +                             Q25 .45
                     |
                 ##  |
                  .  |                             Q24 .45
    5             .  +
                  .  |
                 .# S|
                  .  |                             Q22 .45
    4                +
             ######  |
                  .  |
                     |
    3           ###  +                    Q34 .35
                     |                    Q25 .35
                  .  |
              .####  |
    2             .  +
                     |T                   Q24 .35
                 .#  |
              .####  |
    1             #  +S
                     |                    Q22 .35
                ###  |
                  . M|
    0                +M
              .####  |           Q34 .25
                     |           Q25 .25
                     |
   -1                +S
                .##  |
                  .  |           Q24 .25
                     |T
   -2                +
                .##  |
                     |           Q22 .25
                  .  |
   -3                +
                     |
                  .  |
               .### S|
   -4                +
                     |
                     |
                     |
   -5             .  +
               .###  |
                     |  Q34 .15
                     |  Q25 .15
   -6                +
                  .  |
                 ##  |
                     |  Q24 .15
   -7                +
                     |
                  #  |
                ### T|  Q22 .15
   -8 .############  +
               <less>|
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 53. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
24	34	-0.462
25	34	-0.4287
22	25	-0.4282
22	34	-0.3301
22	24	-0.1507
24	25	-0.1256

Figure 54. Correlations of residuals for each item pair of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons’ responses to item Q34

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-9    -7    -5    -3    -1     1     3     5     7     9
|-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   ITEM
1      1   :       2      :    3    :    4    :  5     5   34  Q34
1     1   :       2       :    3   :    4    :  5      5   25  Q25
|                                                     |
1  1   :       2       :    3   :    4    :  5        5   24  Q24
|                                                     |
11  :       2       :    3   :    4    :   5          5   22  Q22
|-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   ITEM
-9    -7    -5    -3    -1     1     3     5     7     9

3          1    1      1  1    1 1    1        1   2
6   93 18  11   2  261 0  3 2937 24 9 9 17226 14 718     PERSON
          S                M                S
0 10   20     30       40   50 60  70   80     99        PERCENTILE
```

Figure 55. Construct keymap of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons’ responses to item Q34

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   7 .############  +
              .###  |
                 #  |
                 .  |
   6                +
                    |
                ##  |
                 .  |
   5             .  +
                 .  |
                .# S|
                 .  +
   4                +
            ######  |
                 .  |
                    |
   3           ###  +
                    |
                 .  |
             .####  |
   2             .  +
                    |T
                .#  |
             .####  |
   1             #  +S Q34
                    |  Q25
               ###  |
                 . M|
   0                +M
             .####  |  Q24
                    |
                    |
  -1                +S
               .##  |  Q22
                 .  |
                    |T
  -2                +
               .##  |
                    |
                 .  |
  -3                +
                    |
                 .  |
              .### S|
  -4                +
                    |
                    |
                    |
  -5             .  +
              .###  |
                    |
                    |
  -6                +
                 .  |
                ##  |
                    |
  -7                +
                    |
                 #  |
               ### T|
  -8 .############  +
              <less>|<frequ>
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 56. Person-item map of the 4-item group 3 comprising items Q22, Q24, Q25, and Q34, after editing 3 aberrant persons' responses to item Q34

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 19: Study Stress' work-in-progress figures and tables

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	32.1	100.0%		100.0%
Raw variance explained by measures	=	19.1	59.5%		59.4%
Raw variance explained by persons	=	12.8	39.8%		39.7%
Raw Variance explained by items	=	6.3	19.7%		19.7%
Raw unexplained variance (total)	=	13.0	40.5%	100.0%	40.6%
Unexplned variance in 1st contrast	=	2.3	7.2%	17.9%	
Unexplned variance in 2nd contrast	=	1.9	5.9%	14.5%	
Unexplned variance in 3rd contrast	=	1.6	5.1%	12.7%	
Unexplned variance in 4th contrast	=	1.4	4.4%	10.9%	
Unexplned variance in 5th contrast	=	1.3	4.1%	10.0%	

Figure 1. Standardized residual variance of initial Study Stress dimension

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER		ITE	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER		ITE
1	.64	-.33	.86	.86	A	41	Q41	-.57	.57	1.06	1.00	a	46	Q46
1	.59	.24	.86	.92	B	42	Q42	-.55	.33	.95	.87	b	45	Q45
1	.51	.36	1.07	1.04	C	40	Q40	-.45	-.27	1.21	1.20	c	48	Q48
1	.39	-.97	.79	.85	D	43	Q43	-.43	-.36	1.10	1.07	d	47	Q47
1	.19	-.77	.81	.78	E	44	Q44	-.23	1.36	1.10	1.10	e	39	Q39
1	.11	-.20	.94	.96	F	49	Q49	-.19	.98	1.01	1.04	f	38	Q38
1	.09	-.93	1.23	1.23	G	50	Q50							

Figure 2. Standardized residual loadings for items in the first contrast of initial Study Stress dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        STANDARDIZED RESIDUAL CONTRAST 1 PLOT

        -1                     0                     1                     2
        -+---------------------+---------------------+---------------------+-  COUNT
         |             A       |                                           |  1
     .6  +                     |    B                                      +  1
         |                     |                                           |
     .5  +                     |       C                                   +  1
  C      |                     |                                           |
  O  .4  + D                   |                                           +  1
  N      |                     |                                           |
  T  .3  +                     |                                           +
  R      |                     |                                           |
  A  .2  +     E               |                                           +  1
  S      |                     |                                           |
  T  .1  + G                F  |                                           +  2
         |                     |                                           |
  1  .0  +---------------------|-------------------------------------------+
         |                     |                                           |
  L -.1  +                     |                                           +
  O      |                     |                                           |
  A -.2  +                     |                    f                      +  1
  D      |                     |                             e             |  1
  I -.3  +                     |                                           +
  N      |                     |                                           |
  G -.4  +                     |                                           +
         |            d c      |                                           |  2
    -.5  +                     |                                           +
         |                     |      b     a                              |  2
    -.6  +                     |                                           +
        -+---------------------+---------------------+---------------------+-
        -1                     0                     1                     2
                                         ITEM MEASURE
 COUNT:  2   1       111 1         1 11      1       1        1
```

Figure 3. The principal component analysis plot of item loading for the first contrast of the initial Study Stress dimension

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
50	718	268	-.70	.10	1.40	4.1	1.40	4.0	A .77	.82	58.3	58.3	Q50
49	615	260	.19	.11	1.11	1.2	1.10	1.1	B .80	.81	59.8	59.7	Q49
40	548	258	.91	.11	1.09	1.0	1.01	.2	C .78	.78	64.2	62.0	Q40
44	706	270	-.50	.10	.97	-.3	.95	-.6	D .82	.82	65.6	58.5	Q44
42	571	263	.77	.11	.82	-2.1	.94	-.6	c .80	.79	64.1	61.3	Q42
41	649	268	.07	.10	.81	-2.2	.80	-2.4	b .83	.81	68.0	59.5	Q41
43	730	270	-.74	.10	.75	-3.1	.77	-2.8	a .85	.82	70.7	58.2	Q43
MEAN	648.1	265.3	.00	.10	.99	-.2	1.00	-.1			64.4	59.6	
S.D.	67.6	4.6	.63	.00	.21	2.3	.20	2.1			4.0	1.4	

Figure 4. Item statistics, in misfit order, of 7-item group 1 comprising items Q40 to Q44, Q49, and Q50

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (ZSTD) OUTFIT

     50  Q50                      -.70     4.1    A    4.0
   RESPONSE:     1:   2   2   2   1   3    2   2   2   3   5
 Z-RESIDUAL:                     -2

   RESPONSE:    11:   3   2   4   2   2    3   2   3   3   2
 Z-RESIDUAL:

   RESPONSE:    21:   3   5   4   4   3    2   2   1   2   3
 Z-RESIDUAL:          X                   -2

   RESPONSE:    31:   5   M   4   4   1    2   2   5   5   5
 Z-RESIDUAL:                  3                        2

   RESPONSE:    41:   2   2   4   4   M    3   3   3   2   4
 Z-RESIDUAL:

   RESPONSE:    51:   2   2   2   2   1    3   3   3   2   3
 Z-RESIDUAL:

   RESPONSE:    61:   3   1   3   2   3    5   2   2   4   3
 Z-RESIDUAL:          X          -2

   RESPONSE:    71:   2   3   4   4   3    3   5   2   3   2
 Z-RESIDUAL:

   RESPONSE:    81:   3   1   3   4   4    4   3   5   2   4
 Z-RESIDUAL:                                       X

   RESPONSE:    91:   4   3   3   3   3    4   3   5   2   2
 Z-RESIDUAL:                                       3
   RESPONSE:   101:   2   4   2   3   2    3   1   1   2   3
 Z-RESIDUAL:                               2   X   X

   RESPONSE:   111:   3   4   1   3   2    3   4   1   4   5
 Z-RESIDUAL:                                   3

   RESPONSE:   121:   3   3   1   1   3    M   3   1   3   3
 Z-RESIDUAL:                     -2                        2

   RESPONSE:   131:   M   1   4   5   4    2   2   2   4   2
 Z-RESIDUAL:          X

   RESPONSE:   141:   1   4   1   2   2    2   3   2   2   1
 Z-RESIDUAL:              X

   RESPONSE:   151:   1   3   5   2   1    3   1   3   3   4
 Z-RESIDUAL:

   RESPONSE:   161:   5   3   4   4   1    M   2   4   2   3
 Z-RESIDUAL:                         -2

   RESPONSE:   171:   3   4   5   3   3    5   4   2   1   1
 Z-RESIDUAL:                         -3    2           X

   RESPONSE:   181:   2   5   1   1   2    2   3   2   2   2
 Z-RESIDUAL:                      X

   RESPONSE:   191:   2   2   3   3   1    2   1   2   2   3
 Z-RESIDUAL:
   RESPONSE:   201:   2   3   2   4   1    2   1   4   3   2
 Z-RESIDUAL:                          X                   -3

   RESPONSE:   211:   3   5   2   1   2    2   3   1   1   1
 Z-RESIDUAL:              2      -2                        X

   RESPONSE:   221:   1   3   5   5   3    4   4   1   5   2
 Z-RESIDUAL:                  2   5        2

   RESPONSE:   231:   2   2   4   2   5    2   1   3   2   2
 Z-RESIDUAL:

   RESPONSE:   241:   2   2   4   3   2    1   4   4   4   3
 Z-RESIDUAL:

   RESPONSE:   251:   2   1   3   1   2    2   3   3   4   2
 Z-RESIDUAL:          X       X

   RESPONSE:   261:   3   1   3   2   2    1   1   3   2   2
 Z-RESIDUAL:         -2                    X

   RESPONSE:   271:   2   4   3   M
 Z-RESIDUAL:
```
Figure 5. Persons' responses to item Q50 in the 7-item group 1 comprising items Q40 to Q44, Q49, and Q50

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
50	695	262	-.68	.10	1.21	2.2	1.16	1.7	A .81	.83	59.7	59.3	Q50
49	615	260	.19	.11	1.16	1.7	1.17	1.8	B .81	.82	60.2	60.6	Q49
40	548	258	.94	.11	1.13	1.4	1.06	.6	C .78	.79	65.0	62.9	Q40
44	706	270	-.53	.10	1.00	.0	.98	-.2	D .83	.83	65.2	59.6	Q44
42	571	263	.80	.11	.84	-1.8	.97	-.3	c .81	.80	64.9	62.1	Q42
43	730	270	-.78	.10	.79	-2.6	.83	-2.0	b .85	.83	70.7	59.3	Q43
41	649	268	.07	.11	.83	-2.0	.81	-2.2	a .84	.82	68.8	60.5	Q41
MEAN	644.9	264.4	.00	.11	.99	-.2	1.00	-.1			64.9	60.6	
S.D.	64.6	4.5	.65	.00	.16	1.8	.13	1.5			3.7	1.3	

Figure 6. Item statistics, in misfit order, of the 7-item group 1 comprising items Q40 to Q44, Q49, and Q50

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	21.3	100.0%		100.0%
Raw variance explained by measures	=	14.3	67.2%		66.9%
Raw variance explained by persons	=	11.6	54.4%		54.2%
Raw Variance explained by items	=	2.7	12.8%		12.7%
Raw unexplained variance (total)	=	7.0	32.8%	100.0%	33.1%
Unexplned variance in 1st contrast	=	1.9	9.0%	27.4%	
Unexplned variance in 2nd contrast	=	1.6	7.5%	23.0%	
Unexplned variance in 3rd contrast	=	1.1	5.0%	15.3%	
Unexplned variance in 4th contrast	=	.9	4.4%	13.5%	
Unexplned variance in 5th contrast	=	.8	3.7%	11.3%	

Figure 7. Standardized residual variance of the 7-item group 1 comprising items Q40 to Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	360	19	-4.14	-4.17	1.09	1.04	NONE	(-5.17)	1
2	2	707	38	-2.12	-2.09	.96	.99	-4.05	-2.42	2
3	3	477	26	-.25	-.23	.91	.94	-.74	.28	3
4	4	226	12	1.61	1.44	.80	.80	1.35	2.43	4
5	5	81	4	2.79	3.07	1.46	1.50	3.44	(4.62)	5
MISSING		61	3	-1.99						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 8. Category structure of the 7-item group 1 comprising items Q40 to Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                            5|
B      |1                                                        555 |
A      | 1                                                      5    |
B   .8 +  11                                                  55     +
I      |    1                                                5       |
L      |     11        2222222                              5        |
I      |       1     22       2                            5         |
T   .6 +        1   2          2       33         44      5          +
Y      |         1 2            22   33  33    444  44   5           |
    .5 +          *               233      33 4       445            +
O      |         2 1              32         *         54            |
F   .4 +        2   1            3 2        4 3       5  4           +
       |       2     1          3   2      4   3     5    4          |
R      |     22       1       33     2    4     3   5      4         |
E      |    2          1     3        22 4       3 5        44       |
S   .2 +   2            1   3          4*         *           4      +
P      | 22              1*3          4  2      55 33          44    |
O      |2               33 11       44    22  55     33          444 |
N      |           33333     111**44       5**22       3333         4|
S   .0 +************************55*********11111*********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 9. Category probability curves of the 7-item group 1 comprising items Q40 to Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	1.02	.13	M	.72	.22	.29	.26	1.13	141	.2621	.4541	-.48	40	Q40
F	-.05	.12	M	.43	.22	-.48	.25	-1.93	139	.0558	.1132	-.12	41	Q41
F	.71	.13	M	1.09	.23	-.38	.26	-1.44	137	.1534	.0347	-.93	42	Q42
F	-.60	.12	M	-1.33	.20	.74	.23	3.14	146	.0021	.0004	.60	43	Q43
F	-.48	.12	M	-.67	.21	.18	.24	.77	145	.4421	.0884	.31	44	Q44
F	.05	.12	M	.62	.22	-.56	.25	-2.22	135	.0284	.0080	-.33	49	Q49
F	-.66	.12	M	-.74	.21	.08	.24	.34	135	.7333	.9083	.30	50	Q50

Figure 10. Gender DIF of the 7-item group 1 comprising items Q40 to Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.91	.13	M	.49	.22	.42	.26	1.61	134	.1103	.1922	-.09	40	Q40
F	-.14	.12	M	.20	.22	-.34	.25	-1.37	133	.1719	.1465	-.52	41	Q41
F	.61	.13	M	.85	.23	-.24	.26	-.91	131	.3626	.3231	-.07	42	Q42
F	-.57	.12	M	-.89	.21	.32	.24	1.36	137	.1766	.1393	.26	44	Q44
F	-.05	.12	M	.38	.22	-.43	.25	-1.70	131	.0916	.1951	.17	49	Q49
F	-.75	.12	M	-.98	.21	.24	.24	.98	127	.3282	.6283	.32	50	Q50

Figure 11. Gender DIF of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
50	695	262	-.80	.10	1.16	1.7	1.14	1.6	A .81	.83	59.6	58.1	Q50
44	706	270	-.65	.10	1.12	1.4	1.11	1.2	B .81	.83	62.5	58.8	Q44
49	615	260	.05	.11	1.06	.7	1.08	.8	C .82	.82	61.5	60.8	Q49
40	548	258	.80	.11	1.03	.4	.95	-.4	c .80	.80	65.0	62.7	Q40
42	571	263	.66	.11	.80	-2.3	.89	-1.2	b .82	.80	65.7	61.8	Q42
41	649	268	-.06	.10	.76	-2.9	.73	-3.2	a .85	.82	70.4	59.8	Q41
MEAN	630.7	263.5	.00	.11	.99	-.2	.98	-.2			64.1	60.3	
S.D.	58.9	4.2	.60	.00	.15	1.8	.14	1.7			3.5	1.6	

Figure 12. Item statistics, in misfit order, of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		Empirical			Modeled
Total raw variance in observations	=	17.8	100.0%		100.0%
Raw variance explained by measures	=	11.8	66.3%		66.1%
Raw variance explained by persons	=	9.6	54.0%		53.9%
Raw Variance explained by items	=	2.2	12.2%		12.2%
Raw unexplained variance (total)	=	6.0	33.7%	100.0%	33.9%
Unexplned variance in 1st contrast	=	1.8	9.9%	29.3%	
Unexplned variance in 2nd contrast	=	1.3	7.4%	21.8%	
Unexplned variance in 3rd contrast	=	1.1	6.3%	18.6%	
Unexplned variance in 4th contrast	=	1.0	5.5%	16.3%	
Unexplned variance in 5th contrast	=	.8	4.7%	13.9%	

Figure 13. Standardized residual variance of the 6-item group 1 comprising items Q40 to Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
44	706	270	-.65	.10	1.12	1.4	1.11	1.2	.79	.82	62.5	58.8	Q44
40	548	258	.80	.11	1.03	.4	.95	-.4	.80	.80	65.0	62.7	Q40
50	695	262	-.80	.10	1.16	1.7	1.14	1.6	.80	.81	59.6	58.1	Q50
42	571	263	.66	.11	.80	-2.3	.89	-1.2	.82	.80	65.7	61.8	Q42
49	615	260	.05	.11	1.06	.7	1.08	.8	.82	.82	61.5	60.8	Q49
41	649	268	-.06	.10	.76	-2.9	.73	-3.2	.84	.81	70.4	59.8	Q41
MEAN	630.7	263.5	.00	.11	.99	-.2	.98	-.2			64.1	60.3	
S.D.	58.9	4.2	.60	.00	.15	1.8	.14	1.7			3.5	1.6	

Figure 14. Item statistics, in point biserial correlation order, of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	330	21	-4.08	-4.10	1.10	1.03	NONE	(-5.12)	1
2	2	614	39	-2.07	-2.04	.92	.92	-3.99	-2.35	2
3	3	387	24	-.25	-.25	.93	.95	-.65	.29	3
4	4	185	12	1.56	1.36	.77	.76	1.29	2.37	4
5	5	65	4	2.53	2.91	1.60	1.66	3.35	(4.53)	5
MISSING		56	3	-1.72						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 15. Category structure of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                            5|
B      |1                                                        555 |
A      | 11                                                    55    |
B   .8 +   1                                                  5      +
I      |    11                                              55       |
L      |      1        2222222                             5         |
I      |       1      2       22                          5          |
T   .6 +        1   22          2                 4      5           +
Y      |         1 2             2   333333    444 444  5            |
    .5 +          *               2 3      3  4       45             +
O      |         2 1              3*        34        54             |
F   .4 +        2   1            3  2       43       5  44           +
       |       2     1          3    2     4  3      5    4          |
R      |      2       1        3      2   4    33   5      4         |
E      |    22         1      3        244       3 5        4        |
S   .2 +   2            11  33         42        5*          44      +
P      | 22               *3          4  2      5  3           44    |
O      |2               33 111      44    22  55    33           444 |
N      |            3333      11**44      55**22      3333          4|
S   .0 +************************55********111111*********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 16. Category probability curves of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 257 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	14.2	5.8	-1.32	.73	.98	-.2	.97	-.2
S.D.	5.0	.7	2.19	.14	.88	1.4	.88	1.4
MAX.	28.0	6.0	4.27	1.87	6.65	4.6	6.66	4.6
MIN.	2.0	1.0	-5.73	.59	.00	-2.4	.00	-2.4

REAL RMSE .84 TRUE SD 2.02 SEPARATION 2.41 PERSON RELIABILITY .85
MODEL RMSE .74 TRUE SD 2.06 SEPARATION 2.78 PERSON RELIABILITY .89
S.E. OF PERSON MEAN = .14

MAXIMUM EXTREME SCORE: 2 PERSON
MINIMUM EXTREME SCORE: 15 PERSON

SUMMARY OF 6 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	630.7	263.5	.00	.11	.99	-.2	.98	-.2
S.D.	58.9	4.2	.60	.00	.15	1.8	.14	1.7
MAX.	706.0	270.0	.80	.11	1.16	1.7	1.14	1.6
MIN.	548.0	258.0	-.80	.10	.76	-2.9	.73	-3.2

REAL RMSE .11 TRUE SD .59 SEPARATION 5.36 ITEM RELIABILITY .97
MODEL RMSE .11 TRUE SD .59 SEPARATION 5.52 ITEM RELIABILITY .97
S.E. OF ITEM MEAN = .27

DELETED: 1 ITEM

Figure 17. Separations and reliabilities of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
             <more>|
    5             .  +
                     |
                     |
                     |                          Q40 .45
                 .#  |                          Q42 .45
    4                +
                     |
                  .  |                          Q41 .45
                                                Q49 .45
                     |
                     |
    3               T+                          Q44 .45
                 .#  |                          Q50 .45
                  .  |
                 ##  |
                     |                 Q40 .35
    2           .##  +                 Q42 .35
                  .  |
                  #  |
                ###  |                 Q49 .35
                  .  |T                Q41 .35
    1            ##  +
                    S|
                  #  |S                Q44 .35
                                       Q50 .35
                     |
            .######  |
    0        .#####  +M       Q40 .25
                  .  |        Q42 .25
              #####  |
                  .  |S
           .#######  |        Q49 .25
   -1                +        Q41 .25
                  .  |T
             .##### M|        Q44 .25
                  .  |        Q50 .25
             .#####  |
   -2                +
                     |
         .#########  |
                  .  |
                  .  |
   -3        ######  +
                  .  |  Q40 .15
                     |  Q42 .15
              .#### S|
                     |
   -4                +  Q49 .15
                ###  |  Q41 .15
                  #  |
                     |
              .####  |  Q44 .15
                        Q50 .15
   -5             .  +
                     |
                     |
                    T|
                ###  |
   -6         #####  +
             <less>|
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 18. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
41	50	-0.3778
42	50	-0.3705
40	49	-0.3107
40	44	-0.3046
44	49	-0.2851
40	50	-0.2804
42	49	-0.2619
41	49	-0.2162
42	44	-0.2051
44	50	-0.197
41	44	-0.1422
41	42	-0.0351
40	41	-0.0342
49	50	0.0106
40	42	0.0708

Figure 19. Correlations of residuals for each item pair of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-6       -4        -2         0         2         4         6
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
1       1     :       2       :    3     :    4     :    5  5   40  Q40
1       1    :        2      :     3    :    4     :    5   5   42  Q42
|                                                           |
|                                                           |
1    1    :        2      :     3    :    4     :    5      5   49  Q49
1   1    :        2      :     3    :     4     :   5       5   41  Q41
|                                                           |
|                                                           |
11    :        2       :    3    :     4     :   5          5   44  Q44
1     :       2       :    3     :    4     :    5          5   50  Q50
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
-6       -4        -2         0         2         4         6

1     1     1  1  2  1 1  2 1 11
59   13 39  3 28219  7261 215179 3 619317 614   1  4      1 1  PERSON
         S            M            S            T
0    10    20 30 40   50 60  70 80   90           99           PERCENTILE
```

Figure 20. Construct keymap of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   5             .  +
                    |
                    |
                    |
                .#  |
   4                +
                    |
                 .  |
                    |
                    |
   3               T+
                .#  |
                 .  |
                ##  |
                    |
   2           .##  +
                 .  |
                 #  |
               ###  |
                 .  |T
   1            ##  +
                   S|  Q40
                 #  |S Q42
                    |
           .######  |
   0        .#####  +M Q41    Q49
                 .  |
             #####  |
                 .  |S Q44
          .#######  |  Q50
  -1                +
                 .  |T
            .##### M|
                 .  |
            .#####  |
  -2                +
                    |
        .#########  |
                 .  |
                 .  |
  -3        ######  +
                 .  |
                    |
             .#### S|
                    |
  -4                +
               ###  |
                 #  |
                    |
             .####  |
  -5             .  +
                    |
                    |
                   T|
               ###  |
  -6         #####  +
              <less>|<frequ>
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 21. Person-item map of the 6-item group 1 comprising items Q40 to Q42, Q44, Q49, and Q50, after editing 6 odd persons' responses to item Q50, and removing DIF item Q43

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                              -- Empirical --    Modeled
Total raw variance in observations     =       15.5 100.0%        100.0%
  Raw variance explained by measures   =        9.5  61.3%         61.2%
    Raw variance explained by persons  =        7.0  45.3%         45.3%
    Raw Variance explained by items    =        2.5  16.0%         16.0%
  Raw unexplained variance (total)     =        6.0  38.7% 100.0%  38.8%
    Unexplned variance in 1st contrast =        2.1  13.5%  34.9%
    Unexplned variance in 2nd contrast =        1.8  11.3%  29.3%
    Unexplned variance in 3rd contrast =         .8   5.4%  13.9%
    Unexplned variance in 4th contrast =         .7   4.5%  11.8%
    Unexplned variance in 5th contrast =         .6   3.9%  10.0%
```

Figure 22. Standardized residual variance of the 6-item group 2 comprising items Q38, Q39, and Q45 to Q48

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITE	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITE
1	.77	.16	.93	.89	A 46	Q46	-.71	-.83	1.10	1.09	a 48	Q48
1	.61	-.12	.89	.83	B 45	Q45	-.71	-.93	.99	1.00	b 47	Q47
1	.36	1.08	1.06	1.12	C 39	Q39	-.07	.64	1.00	1.04	c 38	Q38

Figure 23. Standardized residual loadings for items in the 6-item group 2 comprising items Q38, Q39, and Q45 to Q48

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
       STANDARDIZED RESIDUAL CONTRAST 1 PLOT

      -1                     0                     1                     2
      -+---------------------+---------------------+---------------------+- COUNT
   .8 +                      |                                            +
      |                      |  A                                         | 1
   .7 +                      |                                            +
      |                      |                                            |
   .6 +                   B  |                                            + 1
      |                      |                                            |
   .5 +                      |                                            +
C     |                      |                                            |
O  .4 +                      |                                            +
N     |                      |                       C                    | 1
T  .3 +                      |                                            +
R     |                      |                                            |
A  .2 +                      |                                            +
S     |                      |                                            |
T  .1 +                      |                                            +
      |                      |                                            |
1  .0 +----------------------|--------------------------------------------+
      |                      |             c                              | 1
L -.1 +                      |                                            +
O     |                      |                                            |
A -.2 +                      |                                            +
D     |                      |                                            |
I -.3 +                      |                                            +
N     |                      |                                            |
G -.4 +                      |                                            +
      |                      |                                            |
  -.5 +                      |                                            +
      |                      |                                            |
  -.6 +                      |                                            +
      |                      |                                            |
  -.7 +  b a                 |                                            + 2
      |                      |                                            |
      -+---------------------+---------------------+---------------------+-
      -1                     0                     1                     2
                                  ITEM MEASURE
 COUNT:  1 1              1     1          1         1
```

Figure 24. The principal component analysis plot of item loading for the first contrast of the 6-item group 2 comprising items Q38, Q39, and Q45 to Q48

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
39	474	266	1.13	.15	1.39	3.5	1.65	5.0	A .79	.86	73.6	71.3	Q39
45	579	271	-.79	.14	.83	-1.8	.83	-1.6	B .91	.89	75.4	66.8	Q45
46	557	273	-.34	.14	.71	-3.2	.71	-3.0	a .93	.89	82.5	69.0	Q46
MEAN	536.7	270.0	.00	.14	.98	-.5	1.06	.1			77.1	69.1	
S.D.	45.2	2.9	.82	.00	.29	2.9	.42	3.5			3.8	1.9	

Figure 25. Item statistics of the 3-item group 2A comprising items Q39, Q45, and Q46

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (ZSTD) OUTFIT

    39  Q39                        1.13     3.5   A    5.0
  RESPONSE:     1:   M   2   2   3   2    1   2   2   2   3
Z-RESIDUAL:              2                    2           2

  RESPONSE:    11:   2   1   1   1   1    2   1   M   3   2
Z-RESIDUAL:                      X   X    2

  RESPONSE:    21:   2   5   1   3   2    1   3   1   2   1
Z-RESIDUAL:              X               -2       X      -2

  RESPONSE:    31:   3   1   1   4   1    1   2   3   2   4
Z-RESIDUAL:              X           X   -2   2           3

  RESPONSE:    41:   2   3   2   2   1    4   1   2   1   2
Z-RESIDUAL:              2           X        X

  RESPONSE:    51:   1   1   1   1   2    1   1   2   1   2
Z-RESIDUAL:          X           X   2                X

  RESPONSE:    61:   1   1   4   2   2    4   1   2   2   2
Z-RESIDUAL:              X                    X   2

  RESPONSE:    71:   2   1   1   2   1    1   3   3   2   1
Z-RESIDUAL:          2               X                    X

  RESPONSE:    81:   2   1   M   1   2    2   1   2   1   4
Z-RESIDUAL:          2   X                    X  -3   X

  RESPONSE:    91:   3   2   2   1   2    3   3   2   1   1
Z-RESIDUAL:                      X            2       X   X
  RESPONSE:   101:   1   2   2   2   1    2   1   1   2   3
Z-RESIDUAL:              2                2   X   X

  RESPONSE:   111:   2   4   1   2   1    2   1   2   2   2
Z-RESIDUAL:                  X       X        X

  RESPONSE:   121:   2   1   1   2   2    2   2   1   2   1
Z-RESIDUAL:                  X   2                X       X

  RESPONSE:   131:   1   1   2   3   3    1   2   1   3   2
Z-RESIDUAL:          X   X                X   2

  RESPONSE:   141:   1   1   1   1   3    1   2   1   1   1
Z-RESIDUAL:          X  -2   X   X                        X

  RESPONSE:   151:   1   1   2   2   1    3   1   1   3   3
Z-RESIDUAL:              X  -3       X                2

  RESPONSE:   161:   3   2   2   1   2    3   2   1   2   2
Z-RESIDUAL:                  2  -2            2   X

  RESPONSE:   171:   2   4   2   2   1    2   2   2   1   1
Z-RESIDUAL:                      2   X                X   X

  RESPONSE:   181:   1   1   1   1   M    1   2   2   2   1
Z-RESIDUAL:          X       X   X

  RESPONSE:   191:   1   2   2   1   1    1   1   2   2   M
Z-RESIDUAL:                      X   X    X   X
  RESPONSE:   201:   2   2   1   3   1    2   1   2   2   4
Z-RESIDUAL:                          X

  RESPONSE:   211:   2   3   2   2   1    1   1   1   1   1
Z-RESIDUAL:                                       X  -2   X

  RESPONSE:   221:   M   2   1   2   1    2   2   2   4   2
Z-RESIDUAL:                         -2                    2

  RESPONSE:   231:   4   2   1   1   2    1   1   2   1   2
Z-RESIDUAL:          3       X           -2   X           2

  RESPONSE:   241:   1   2   1   2   1    1   3   2   3   1
Z-RESIDUAL:                  X            X

  RESPONSE:   251:   3   1   1   M   2    2   2   2   1   M
Z-RESIDUAL:              X  -2

  RESPONSE:   261:   1   1   2   2   2    2   1   2   2   2
Z-RESIDUAL:                  2            2

  RESPONSE:   271:   1   1   3   2
Z-RESIDUAL:          X
```

Figure 26. Persons’ responses to item Q39 in the 3-item group 2A comprising items Q39, Q45, and Q46

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
39	462	262	1.24	.15	1.27	2.5	1.62	3.2	A .82	.87	75.0	73.2	Q39
45	579	271	-.87	.14	.85	-1.5	.84	-.9	B .89	.88	73.2	69.5	Q45
46	557	273	-.37	.15	.78	-2.3	.76	-1.4	a .90	.88	83.3	71.4	Q46
MEAN	532.7	268.7	.00	.15	.97	-.5	1.07	.3			77.2	71.4	
S.D.	50.8	4.8	.90	.00	.22	2.1	.39	2.1			4.4	1.5	

Figure 27. Item statistics of the 3-item group 2A comprising items Q39, Q45, and Q46, after editing 4 odd persons' responses to item Q39.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
46	557	273	.48	.20	.99	.0	.81	-.6	A .94	.94	85.7	83.0	Q46
45	579	271	-.48	.20	.98	-.1	.80	-.6	a .93	.93	85.7	82.9	Q45
MEAN	568.0	272.0	.00	.20	.99	.0	.81	-.6			85.7	83.0	
S.D.	11.0	1.0	.48	.00	.00	.0	.00	.0			.0	.0	

Figure 28. Item statistics of the 2-item group 2A comprising items Q45 and Q46, after removing item Q39

SUMMARY OF 189 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	5.0	2.0	-4.67	3.58	.75	-.6	.75	-.6
S.D.	1.4	.0	5.04	5.15	2.03	1.3	2.03	1.3
MAX.	9.0	2.0	15.32	20.45	9.90	7.1	9.90	7.1
MIN.	3.0	2.0	-11.01	1.43	.00	-1.5	.00	-1.5

REAL RMSE 6.44 TRUE SD .00 SEPARATION .00 PERSON RELIABILITY .00
MODEL RMSE 6.27 TRUE SD .00 SEPARATION .00 PERSON RELIABILITY .00
S.E. OF PERSON MEAN = .37

MAXIMUM EXTREME SCORE: 4 PERSON
MINIMUM EXTREME SCORE: 80 PERSON
LACKING RESPONSES: 1 PERSON

Figure 29. Person separation and person reliability of the 2-item group 2A comprising items Q45 and Q46, after removing item Q39

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
38	508	266	1.39	.13	1.30	2.9	1.38	3.3	A .76	.82	68.9	69.4	Q38
48	650	273	-.63	.12	.83	-1.9	.84	-1.8	B .89	.86	67.3	64.3	Q48
47	658	272	-.76	.12	.80	-2.3	.80	-2.3	a .89	.86	70.5	63.1	Q47
MEAN	605.3	270.3	.00	.12	.98	-.4	1.01	-.3			68.9	65.6	
S.D.	68.9	3.1	.99	.01	.23	2.4	.27	2.5			1.3	2.7	

Figure 28. Item statistics of the 3-item group 2B comprising items Q38, Q47, and Q48

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (ZSTD) OUTFIT

    38  Q38                      1.39     2.9   A    3.3
  RESPONSE:    1:   M   3   2   3   1    1   2   2   2   3
Z-RESIDUAL:             2          -2

  RESPONSE:   11:   2   2   4   1   M    3   1   M   3   2
Z-RESIDUAL:                              3

  RESPONSE:   21:   3   5   3   3   2    1   2   1   2   2
Z-RESIDUAL:             X   2           -2

  RESPONSE:   31:   1   1   2   2   1    1   1   3   3   4
Z-RESIDUAL:        -3                   -2

  RESPONSE:   41:   3   2   2   2   2    4   1   3   2   2
Z-RESIDUAL:

  RESPONSE:   51:   1   2   3   1   2    2   2   2   1   2
Z-RESIDUAL:                    -2

  RESPONSE:   61:   1   1   4   2   2    4   2   2   2   2
Z-RESIDUAL:             X

  RESPONSE:   71:   1   1   2   2   2    2   3   3   3   1
Z-RESIDUAL:        -2                            2

  RESPONSE:   81:   2   1   1   1   2    2   1   2   1   3
Z-RESIDUAL:         3   X      -2               -2

  RESPONSE:   91:   3   2   2   1   2    3   3   2   2   1
Z-RESIDUAL:                                              X
  RESPONSE:  101:   1   2   2   2   2    1   1   1   2   3
Z-RESIDUAL:                              X   X   X

  RESPONSE:  111:   1   4   2   2   1    1   2   2   3   2
Z-RESIDUAL:                 3

  RESPONSE:  121:   2   1   1   2   3    2   2   1   2   1
Z-RESIDUAL:                 X                3           X

  RESPONSE:  131:   1   1   2   3   4    2   1   2   4   2
Z-RESIDUAL:             X       2   2

  RESPONSE:  141:   1   1   1   2   2    1   2   1   2   1
Z-RESIDUAL:            -2   X

  RESPONSE:  151:   1   1   2   2   1    3   2   1   3   3
Z-RESIDUAL:                                          2

  RESPONSE:  161:   3   1   1   2   2    2   2   1   2   2
Z-RESIDUAL:                                     -2  -2

  RESPONSE:  171:   2   4   3   2   5    2   2   2   1   1
Z-RESIDUAL:                         X                X

  RESPONSE:  181:   2   1   1   1   M    2   1   2   2   2
Z-RESIDUAL:            -2   X   X

  RESPONSE:  191:   1   2   1   3   1    2   1   2   2   M
Z-RESIDUAL:                -2       X        X
  RESPONSE:  201:   2   2   1   2   1    2   1   3   2   4
Z-RESIDUAL:                         X

  RESPONSE:  211:   1   3   2   2   1    1   1   1   1   1
Z-RESIDUAL:                                      X   X

  RESPONSE:  221:   M   2   1   1   2    3   2   1   4   2
Z-RESIDUAL:                              3       X   3

  RESPONSE:  231:   2   2   3   1   3    1   1   2   2   2
Z-RESIDUAL:                 2                X

  RESPONSE:  241:   1   2   2   2   1    1   3   3   2   1
Z-RESIDUAL:                 3            X              -2

  RESPONSE:  251:   2   1   2   M   2    3   2   2   1   M
Z-RESIDUAL:             X                2          -2

  RESPONSE:  261:   1   1   1   2   2    2   2   2   2   2
Z-RESIDUAL:                              3

  RESPONSE:  271:   1   2   2   2
Z-RESIDUAL:         X
```

Figure 29. Persons' responses to item Q38 in the 3-item group 2B comprising items Q38, Q47, and Q48

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
38	487	257	1.72	.14	1.18	1.8	1.16	1.4	A .80	.83	70.3	72.6	Q38
48	650	273	-.78	.13	.91	-.9	.92	-.8	B .89	.88	67.6	66.7	Q48
47	658	272	-.94	.13	.84	-1.8	.83	-1.8	a .89	.88	71.3	65.9	Q47
MEAN	598.3	267.3	.00	.13	.98	-.3	.97	-.4			69.7	68.4	
S.D.	78.8	7.3	1.22	.01	.15	1.6	.14	1.3			1.5	3.0	

Figure 30. Item statistics of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	11.0	100.0%		100.0%
Raw variance explained by measures	=	8.0	72.8%		71.8%
Raw variance explained by persons	=	6.5	59.0%		58.2%
Raw Variance explained by items	=	1.5	13.7%		13.5%
Raw unexplained variance (total)	=	3.0	27.2%	100.0%	28.2%
Unexplned variance in 1st contrast	=	1.5	13.2%	48.5%	

Figure 31. Standardized residual variance of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38.

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
38	487	257	1.72	.14	1.18	1.8	1.16	1.4	.80	.84	70.3	72.6	Q38
48	650	273	-.78	.13	.91	-.9	.92	-.8	.89	.88	67.6	66.7	Q48
47	658	272	-.94	.13	.84	-1.8	.83	-1.8	.90	.88	71.3	65.9	Q47
MEAN	598.3	267.3	.00	.13	.98	-.3	.97	-.4			69.7	68.4	
S.D.	78.8	7.3	1.22	.01	.15	1.6	.14	1.3			1.5	3.0	

Figure 32. Item statistics, in point-biserial correlation order, of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	193	24	-5.81	-5.95	1.17	1.19	NONE	(-6.82)	1
2	2	340	42	-3.11	-3.05	.93	.87	-5.72	-3.34	2
3	3	181	23	-.20	-.20	.91	.93	-.96	.57	3
4	4	61	8	2.39	2.30	.85	.85	2.14	3.35	4
5	5	27	3	4.69	4.62	1.01	1.06	4.53	(5.70)	5
MISSING		10	1	-4.18						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 33. Category structure of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                      555|
A      |             2222                                    5   |
B   .8 +1          22    22                                 5    +
I      | 1        2        2                               5     |
L      |  1      2          2        3333                 5      |
I      |   1    2            2     33    3               5       |
T   .6 +   1   2              2   3       3    44444    5        +
Y      |    1 2                2 3         3  4     44 5         |
    .5 +     *                  *           34        *          +
O      |    2 1                3 2          43        54         |
F   .4 +   2   1               3 2         4  3      5  4        +
       |   2   1              3   2       4   3     5   4        |
R      |  2     1            3     2      4    3   5     4       |
E      | 2       1          3       2    4      3 5       44     |
S   .2 +2         11       3         2  4        35         4    +
P      |            1   33            **       553           4   |
O      |             1133           44  2      5  33          444|
N      |           33331111     444     222*55      333         |
S   .0 +************************************1********************+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -7      -5      -3      -1       1       3       5       7
        PERSON [MINUS] ITEM MEASURE
```

Figure 34. Category probability curve of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	1.63	.16	M	2.02	.29	-.40	.33	-1.20	124	.2305	.3284	-.30	38	Q38
F	-.81	.15	M	-1.32	.25	.51	.29	1.77	129	.0796	.1154	.14	47	Q47
F	-.83	.15	M	-.63	.25	-.20	.29	-.69	128	.4894	.6595	.16	48	Q48

Figure 35. Gender DIF of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 239 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	7.0	3.0	-2.09	1.20	.95	-.2	.96	-.2
S.D.	2.3	.2	2.81	.17	1.15	1.1	1.20	1.1
MAX.	14.0	3.0	5.70	2.52	8.14	3.7	8.51	3.7
MIN.	2.0	1.0	-6.72	.96	.00	-2.8	.00	-2.7

REAL RMSE 1.41 TRUE SD 2.43 SEPARATION 1.72 PERSON RELIABILITY .75
MODEL RMSE 1.21 TRUE SD 2.54 SEPARATION 2.10 PERSON RELIABILITY .82
S.E. OF PERSON MEAN = .18

MAXIMUM EXTREME SCORE: 2 PERSON
MINIMUM EXTREME SCORE: 33 PERSON

SUMMARY OF 3 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	598.3	267.3	.00	.13	.98	-.3	.97	-.4
S.D.	78.8	7.3	1.22	.01	.15	1.6	.14	1.3
MAX.	658.0	273.0	1.72	.14	1.18	1.8	1.16	1.4
MIN.	487.0	257.0	-.94	.13	.84	-1.8	.83	-1.8

REAL RMSE .14 TRUE SD 1.21 SEPARATION 8.91 ITEM RELIABILITY .99
MODEL RMSE .13 TRUE SD 1.21 SEPARATION 9.23 ITEM RELIABILITY .99
S.E. OF ITEM MEAN = .86

Figure 36. Separations and reliabilities of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
   7              .  +
                     |
                     |                             Q38 .45
                     |
   6                 +
                  .  |
                     |
                     |
   5                 +
                     |
                     |
                  .  |
   4                 +                             Q48 .45
                  .  |                    Q38 .35  Q47 .45
                    T|
                 ##  |
   3                 +
                     |
                 .#  |T
                     |
   2                 +
                     |
                .##  |
                     |S                   Q48 .35
   1                 +                    Q47 .35
                    S|           Q38 .25
             .#####  |
                     |
   0                 +M
                     |
           .#######  |
                     |
  -1                 +
                     |S
                  .  |
        .##########  |           Q48 .25
  -2              . M+           Q47 .25
                     |
                     |T
                     |
  -3                 +
      #############  |
                     |
                     |
  -4                 +  Q38 .15
                  .  |
                     |
                     |
  -5      .######## S+
                  .  |
                     |
                     |
  -6                 +
                     |
                  .  |  Q48 .15
              .####  |  Q47 .15
  -7      .########  +
               <less>|
EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 37. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
38	48	-0.5343
47	48	-0.4752
38	47	-0.4751

Figure 38. Correlations of residuals for each item pair of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38

```
TABLE 2.2 04 Apr data.xls                        ZOU781WS.TXT  Jul 30 13:52 2018
INPUT: 274 PERSON  172 ITEM  REPORTED: 274 PERSON  3 ITEM  5 CATS WINSTEPS 3.71.0.1
----------------------------------------------------------------------------------

EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-8     -6     -4     -2      0      2      4      6      8
|------+------+------+------+------+------+------+------|  NUM   ITEM
1         1   :        2       :     3    :    4    :  5 5   38  Q38
|                                                       |
|                                                       |
11   :        2       :     3    :    4    :  5          5   48  Q48
11   :       2       :     3    :    4    :  5          5   47  Q47
|------+------+------+------+------+------+------+------|  NUM   ITEM
-8     -6     -4     -2      0      2      4      6      8

3   1     3      5    4   3   2  1
3   92    15  3   2   12   0   2  1   7  8 12    3     2    PERSON
      S           M           S           T
0 10    20 30   50   60  70  80 90            99           PERCENTILE
```

Figure 39. Construct keymap of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons' responses to item Q38

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
 7              .   +
                    |
                    |
                    |
 6                  +
                .   |
                    |
                    |
 5                  +
                    |
                    |
                .   |
 4                  +
                .   |
                   T|
              ##    |
 3                  +
                    |
              .#    |T
                    |
 2                  +
                    |  Q38
             .##    |
                    |S
 1                  +
                   S|
          .#####    |
                    |
 0                  +M
                    |
        .#######    |
                    |  Q48
-1                  +  Q47
                    |S
                .   |
     .##########    |
-2              .  M+
                    |
                    |T
                    |
-3                  +
   #############    |
                    |
                    |
-4                  +
                .   |
                    |
                    |
-5       .########  S+
                .   |
                    |
                    |
-6                  +
                    |
                .   |
           .####    |
-7       .########  +
              <less>|<frequ>
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 40. Person-item map of the 3-item group 2B comprising items Q38, Q47, and Q48, after editing 9 aberrant persons’ responses to item Q38

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 20: Cultural Difference's work-in-progress figures and tables

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	54.7	100.0%		100.0%
Raw variance explained by measures	=	27.7	50.6%		51.1%
Raw variance explained by persons	=	23.8	43.5%		44.0%
Raw Variance explained by items	=	3.9	7.1%		7.2%
Raw unexplained variance (total)	=	27.0	49.4%	100.0%	48.9%
Unexplned variance in 1st contrast	=	3.3	6.1%	12.3%	
Unexplned variance in 2nd contrast	=	2.7	4.9%	10.0%	
Unexplned variance in 3rd contrast	=	2.3	4.2%	8.6%	
Unexplned variance in 4th contrast	=	2.1	3.8%	7.6%	
Unexplned variance in 5th contrast	=	1.6	2.9%	6.0%	

Figure 1. Standardized residual variance of initial Cultural Difference dimension

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITE	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITE
1	.68	-.45	.94	.93	A 73	Q73	-.56	-.11	.72	.78	a 54	Q54
1	.60	-.65	.92	.99	B 75	Q75	-.49	-.10	.69	.64	b 55	Q55
1	.59	-.29	.82	.81	C 76	Q76	-.49	.35	.81	.71	c 53	Q53
1	.47	-.12	.87	.82	D 74	Q74	-.42	-.14	.78	.86	d 56	Q56
1	.38	-.16	.73	.80	E 77	Q77	-.36	.01	.66	.83	e 51	Q51
1	.34	.16	.69	.66	F 72	Q72	-.35	.16	.65	.71	f 60	Q60
1	.25	-.73	1.76	1.97	G 61	Q61	-.29	.00	1.05	1.05	g 58	Q58
1	.19	-.64	1.95	2.26	H 66	Q66	-.25	-.20	.74	.83	h 52	Q52
1	.11	-.02	.98	1.08	I 70	Q70	-.23	-.27	1.09	1.14	i 57	Q57
1	.03	.14	1.69	1.98	J 64	Q64	-.21	.52	.76	.69	j 68	Q68
1	.00	.17	1.48	1.79	K 63	Q63	-.18	.67	.68	.60	k 71	Q71
							-.18	-.02	.66	.72	l 62	Q62
							-.16	1.20	1.04	.81	m 69	Q69
							-.14	1.14	1.30	1.21	N 65	Q65
							-.04	-.39	1.15	1.24	M 59	Q59
							-.01	-.24	1.41	1.66	L 67	Q67

Figure 2. Standardized residual loadings for items in the first contrast of initial Cultural Difference dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
       STANDARDIZED RESIDUAL CONTRAST 1 PLOT

      -1                     0                     1                     2
      -+---------------------+---------------------+---------------------+- COUNT
   .7 +            A         |                                            + 1
      |                      |                                            |
   .6 +        B       C     |                                            + 2
      |                      |                                            |
C  .5 +                      |                                            +
O     |                   D  |                                            | 1
N  .4 +                  E   |                                            + 1
T     |                      |  F                                         | 1
R  .3 +                      |                                            +
A     |      G               |                                            | 1
S  .2 +        H             |                                            + 1
T     |                      |                                            |
   .1 +                      I                                            + 1
1     |                      |  J                                         | 1
   .0 +-----------------L----|---K----------------------------------------+ 2
L     |              M       |                                            | 1
O -.1 +                      |                                            +
A     |                      |                        Nm                  | 2
D -.2 +                      l          j   k                             + 3
I     |                i h   |                                            | 2
N -.3 +                      g                                            + 1
G     |                      e  f                                         | 2
  -.4 +                   d  |                                            + 1
      |                      |                                            |
  -.5 +                    b |       c                                    + 2
      |                    a |                                            | 1
  -.6 +                      |                                            +
      -+---------------------+---------------------+---------------------+-
      -1                     0                     1                     2
                                  ITEM MEASURE
 COUNT:      1 2   1 1 21222 4  31   1  1   1         11
```

Figure 3. The principal component analysis plot of item loading for the first contrast of the initial Cultural Difference dimension

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
77	563	263	.22	.12	1.16	1.5	1.06	.6	A .84	.85	66.7	63.8	Q77
72	491	249	.81	.13	1.03	.4	1.11	1.0	B .81	.82	68.7	65.6	Q72
74	545	256	.27	.12	1.10	1.0	1.01	.1	C .84	.84	69.9	63.7	Q74
75	648	265	-.81	.11	.99	-.1	1.06	.6	c .86	.87	67.6	60.3	Q75
73	578	246	-.41	.12	.90	-.9	.91	-.9	b .87	.86	69.6	62.2	Q73
76	571	256	-.07	.12	.77	-2.4	.74	-2.7	a .88	.85	71.3	62.7	Q76
MEAN	566.0	255.8	.00	.12	.99	-.1	.98	-.2			69.0	63.1	
S.D.	46.5	6.8	.52	.00	.13	1.3	.12	1.3			1.5	1.6	

Figure 4. Item statistics, in misfit order, of 6-item group 1 comprising items Q72 to Q77.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	19.6	100.0%		100.0%
Raw variance explained by measures	=	13.6	69.4%		69.2%
Raw variance explained by persons	=	12.4	63.2%		63.0%
Raw Variance explained by items	=	1.2	6.2%		6.2%
Raw unexplained variance (total)	=	6.0	30.6%	100.0%	30.8%
Unexplned variance in 1st contrast	=	1.7	8.5%	27.9%	
Unexplned variance in 2nd contrast	=	1.3	6.6%	21.6%	
Unexplned variance in 3rd contrast	=	1.1	5.6%	18.2%	
Unexplned variance in 4th contrast	=	1.0	5.3%	17.4%	
Unexplned variance in 5th contrast	=	.9	4.5%	14.7%	

Figure 5. Standardized residual variance of the 6-item group 1 comprising items Q72 to Q77

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
77	563	263	.22	.12	1.16	1.5	1.06	.6	.81	.83	66.7	63.8	Q77
72	491	249	.81	.13	1.03	.4	1.11	1.0	.83	.84	68.7	65.6	Q72
75	648	265	-.81	.11	.99	-.1	1.06	.6	.84	.85	67.6	60.3	Q75
74	545	256	.27	.12	1.10	1.0	1.01	.1	.85	.86	69.9	63.7	Q74
73	578	246	-.41	.12	.90	-.9	.91	-.9	.87	.85	69.6	62.2	Q73
76	571	256	-.07	.12	.77	-2.4	.74	-2.7	.89	.86	71.3	62.7	Q76
MEAN	566.0	255.8	.00	.12	.99	-.1	.98	-.2			69.0	63.1	
S.D.	46.5	6.8	.52	.00	.13	1.3	.12	1.3			1.5	1.6	

Figure 6. Item statistics, in point-biserial correlation order, of 6-item group 1 comprising items Q72 to Q77.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	464	30	-4.45	-4.43	1.03	.95	NONE	(-5.25)	1
2	2	572	37	-2.10	-2.11	.95	.95	-4.13	-2.26	2
3	3	290	19	-.04	-.03	.99	1.01	-.35	.54	3
4	4	127	8	1.58	1.51	.83	.81	1.60	2.31	4
5	5	82	5	2.78	2.87	1.22	1.36	2.89	(4.15)	5
MISSING		77	5	-1.91						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 7. Category structure of 6-item group 1 comprising items Q72 to Q77.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-|
R  1.0 +                                                             +
O      |                                                          555|
B      |                                                       555   |
A      |11                                                   55      |
B   .8 +  11                                               55        +
I      |    1           2222222                           5          |
L      |     1        22       2                         5           |
I      |      1      2          2                       5            |
T   .6 +       1    2            22                    5             +
Y      |        1 22               2   33333          5              |
    .5 +         *                 2 33     3    44  5               +
O      |        2 1                 *        3 44  445               |
F   .4 +       2   1               3 2       4*     544              +
       |      2     1            33   2     4  3   5   4             |
R      |     2       1          3      2   4    3 5     44           |
E      |    2         11       3        2 4      *        4          |
S   .2 +  22            1    33          *      5 3        44        +
P      |22               11 3          44 22   5   33        44      |
O      |                 33*1        44     2*5      33        44    |
N      |             3333    11111444     555 222      333       4444|
S   .0 +**********************************1111111********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 8. Category probability curves of 6-item group 1 comprising items Q72 to Q77.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.75	.14	M	1.00	.25	-.25	.29	-.86	111	.3898	1.000	.23	72	Q72
F	-.49	.13	M	-.19	.23	-.30	.27	-1.11	110	.2707	.5211	.15	73	Q73
F	.31	.14	M	.13	.23	.18	.27	.68	118	.4989	.6248	.74	74	Q74
F	-.72	.13	M	-1.06	.21	.34	.25	1.35	125	.1808	.9663	-.07	75	Q75
F	-.11	.13	M	.06	.23	-.16	.27	-.61	114	.5419	.5836	-.52	76	Q76
F	.25	.14	M	.13	.23	.12	.27	.43	120	.6675	.5554	-.17	77	Q77

Figure 9. Gender DIF of 6-item group 1 comprising items Q72 to Q77.

SUMMARY OF 229 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	13.5	5.7	-1.51	.78	.95	-.3	.96	-.3
S.D.	5.5	1.0	2.38	.22	.99	1.5	.99	1.4
MAX.	29.0	6.0	4.71	2.04	6.85	4.0	6.34	3.9
MIN.	2.0	1.0	-5.84	.54	.00	-2.7	.00	-2.6

REAL RMSE .91 TRUE SD 2.20 SEPARATION 2.41 PERSON RELIABILITY .85
MODEL RMSE .81 TRUE SD 2.24 SEPARATION 2.75 PERSON RELIABILITY .88
S.E. OF PERSON MEAN = .16

MAXIMUM EXTREME SCORE: 4 PERSON
MINIMUM EXTREME SCORE: 38 PERSON
LACKING RESPONSES: 3 PERSON

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 6 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	566.0	255.8	.00	.12	.99	-.1	.98	-.2
S.D.	46.5	6.8	.52	.00	.13	1.3	.12	1.3
MAX.	648.0	265.0	.81	.13	1.16	1.5	1.11	1.0
MIN.	491.0	246.0	-.81	.11	.77	-2.4	.74	-2.7

REAL RMSE .12 TRUE SD .50 SEPARATION 4.18 ITEM RELIABILITY .95
MODEL RMSE .12 TRUE SD .50 SEPARATION 4.29 ITEM RELIABILITY .95
S.E. OF ITEM MEAN = .23

Figure 10. Separations and reliabilities of 6-item group 1 comprising items Q72 to Q77.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   5             .#  +
                  .  |
                     |
                     |
                     |
   4              .  +
                     |
                     |
                  .  |
                    T|
   3             .#  +
                     |
                  .  |
                 ##  |
                  .  |
   2              .  +
                  #  |
                     |
                ###  |
                 .#  |
   1                 +T
                .## S|  Q72
               .###  |S
                  .  |
               ####  |  Q74    Q77
   0              .  +M Q76
              .####  |
                     |  Q73
                .##  |S
                  .  |  Q75
  -1           .###  +T
                  .  |
                     |
             .##### M|
                     |
  -2              #  +
        ###########  |
                 ##  |
                     |
                     |
  -3         .#####  +
                  .  |
                  .  |
               .###  |
                    S|
  -4              .  +
                 ##  |
                  .  |
                  .  |
             .#####  |
  -5                 +
                     |
                     |
                  .  |
              .####  |
  -6  .############  +
              <less>|<frequ>
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 11. Person-item map of 6-item group 1 comprising items Q72 to Q77.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    5            .#  +
                  .  |
                     |
                     |
                     |                             Q72 .45
    4             .  +
                     |
                     |                             Q74 .45
                                                   Q77 .45
                  .  |
                    T|                             Q76 .45
    3            .#  +                             Q73 .45
                     |
                  .  |                             Q75 .45
                 ##  |
                  .  |                    Q72 .35
    2             .  +
                  #  |                    Q74 .35
                     |                    Q77 .35
                ###  |                    Q76 .35
                 .#  |
    1                +T                   Q73 .35
                .## S|
               .###  |S                   Q75 .35
                  .  |
               ####  |           Q72 .25
    0             .  +M
              .####  |
                     |           Q74 .25
                                 Q77 .25
                .##  |S          Q76 .25
                  .  |
   -1          .###  +T          Q73 .25
                  .  |
                     |           Q75 .25
             .##### M|
                     |
   -2             #  +
        ###########  |
                 ##  |
                     |
                     |
   -3        .#####  +
                  .  |
                  .  |  Q72 .15
               .###  |
                    S|
   -4             .  +  Q74 .15
                        Q77 .15
                 ##  |  Q76 .15
                  .  |
                  .  |  Q73 .15
             .#####  |
   -5                +  Q75 .15
                     |
                     |
                  .  |
              .####  |
   -6 .############  +
               <less>|
 EACH "#" IS 3. EACH "." IS 1 TO 2
```
Figure 12. Person-item map: Expected score zones (Rasch-half-point thresholds), of 6-item group 1 comprising items Q72 to Q77.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
72	75	-0.3833
75	77	-0.3603
72	74	-0.2967
73	77	-0.2704
73	74	-0.2545
72	76	-0.2535
74	77	-0.2264
76	77	-0.2248
73	76	-0.2021
73	75	-0.1933
74	76	-0.1044
74	75	-0.0986
75	76	-0.0793
72	73	-0.0431
72	77	0.0277

Figure 13. Correlations of residuals for each item pair of 6-item group 1 comprising items Q72 to Q77.

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-7       -5        -3        -1         1         3         5
|---------+---------+---------+---------+---------+---------| NUM   ITEM
1            1    :         2       :     3   :    4    :   5  72  Q72
|                                                           |
|                                                           |
1         1    :         2       :     3    :   4    :   5  5  74  Q74
1         1    :         2       :     3   :    4    :   5  5  77  Q77
|                                                           |
1       1     :        2        :    3    :   4    :   5    5  76  Q76
|                                                           |
1      1    :         2       :     3   :   4     :   5     5  73  Q73
|                                                           |
1    1    :         2       :     3   :   4     :   5       5  75  Q75
|---------+---------+---------+---------+---------+---------| NUM   ITEM
-7       -5        -3        -1         1         3         5

3     1    1     1  1   3  1  1   1 1 1
43  1 31   62161 1116  633 6 1018 422107 59 31162 5 11 2   13 PERSON
         S              M              S               T
0 10      20    30    40 50 60   70  80  90                99 PERCENTILE
```

Figure 14. Construct keymap of 6-item group 1 comprising items Q72 to Q77.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
66	627	258	-.72	.07	1.45	4.5	1.63	5.7	A .58	.68	33.5	43.1	Q66
61	590	234	-.80	.08	1.52	4.9	1.62	5.4	B .59	.68	38.9	42.4	Q61
64	533	272	.00	.08	1.32	3.0	1.45	3.9	C .56	.62	48.2	50.7	Q64
63	520	267	.02	.08	1.19	1.8	1.25	2.2	D .60	.62	49.6	50.8	Q63
59	580	256	-.48	.08	1.01	.1	1.13	1.3	E .64	.66	52.3	46.0	Q59
67	584	268	-.35	.08	.96	-.4	.99	-.1	F .66	.65	52.4	47.0	Q67
65	404	264	.90	.10	.96	-.3	.85	-1.1	f .57	.54	66.5	62.3	Q65
69	413	272	.95	.10	.87	-1.2	.68	-2.6	e .60	.53	66.4	62.5	Q69
70	557	271	-.15	.08	.80	-2.2	.84	-1.6	d .67	.63	59.6	49.5	Q70
62	535	259	-.16	.08	.63	-4.4	.71	-3.1	c .69	.63	60.6	49.5	Q62
68	484	271	.33	.09	.69	-3.3	.66	-3.4	b .67	.59	67.8	53.8	Q68
71	459	267	.45	.09	.61	-4.2	.61	-3.9	a .67	.57	67.5	54.7	Q71
MEAN	523.8	263.3	.00	.08	1.00	-.1	1.03	.2			55.3	51.0	
S.D.	68.0	10.3	.55	.01	.30	3.1	.36	3.3			11.0	6.2	

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 15. Item statistics, in misfit order, of 12-item group 2 comprising items Q59, and Q61 to Q71.

ITEM STATISTICS: MISFIT ORDER

ENTRY	TOTAL	TOTAL		MODEL	INFIT		OUTFIT		PT-MEASURE		EXACT MATCH		
NUMBER	SCORE	COUNT	MEASURE	S.E.	MNSQ	ZSTD	MNSQ	ZSTD	CORR.	EXP.	OBS%	EXP%	ITEM
61	590	234	-.92	.08	1.57	5.3	1.64	5.6	A .61	.70	36.1	42.3	Q61
64	533	272	-.07	.08	1.38	3.5	1.52	4.4	B .57	.64	49.0	51.3	Q64
67	584	268	-.44	.08	1.14	1.5	1.25	2.5	C .64	.67	50.8	48.1	Q67
63	520	267	-.04	.08	1.21	2.0	1.24	2.2	D .62	.64	50.8	51.4	Q63
59	580	256	-.58	.08	1.07	.8	1.16	1.6	E .65	.68	51.9	46.3	Q59
65	404	264	.89	.10	1.02	.2	.99	.0	F .57	.56	67.8	61.7	Q65
70	557	271	-.23	.08	.83	-1.9	.90	-1.0	e .68	.65	56.2	49.1	Q70
69	413	272	.94	.10	.88	-1.1	.69	-2.5	d .61	.55	69.2	62.0	Q69
62	535	259	-.24	.08	.65	-4.2	.72	-3.0	c .71	.65	59.2	49.1	Q62
68	484	271	.28	.09	.70	-3.2	.67	-3.3	b .68	.61	68.7	54.5	Q68
71	459	267	.41	.09	.60	-4.4	.59	-4.1	a .69	.59	69.5	55.8	Q71
MEAN	514.5	263.7	.00	.09	1.00	-.1	1.03	.2			57.2	52.0	
S.D.	63.2	10.7	.56	.01	.30	3.0	.34	3.1			10.3	5.8	

Figure 16. Item statistics, in misfit order, of 11-item group 2 comprising items Q59, Q61 to Q65, and Q67 to Q71, after removing misfitting item Q66.

ITEM STATISTICS: MISFIT ORDER

ENTRY	TOTAL	TOTAL		MODEL	INFIT		OUTFIT		PT-MEASURE		EXACT MATCH		
NUMBER	SCORE	COUNT	MEASURE	S.E.	MNSQ	ZSTD	MNSQ	ZSTD	CORR.	EXP.	OBS%	EXP%	ITEM
64	533	272	-.16	.09	1.42	3.9	1.51	4.4	A .61	.68	48.4	52.9	Q64
63	520	267	-.15	.09	1.29	2.7	1.26	2.3	B .65	.67	49.2	52.7	Q63
67	584	268	-.58	.08	1.22	2.2	1.28	2.7	C .66	.70	50.8	50.0	Q67
59	580	256	-.73	.08	1.21	2.1	1.27	2.6	D .66	.71	47.2	48.8	Q59
65	404	264	.86	.11	1.04	.4	.95	-.3	E .60	.59	68.8	63.7	Q65
70	557	271	-.35	.08	.92	-.8	.97	-.3	e .69	.69	60.3	51.7	Q70
69	413	272	.92	.11	.88	-1.1	.69	-2.5	d .64	.58	71.0	63.9	Q69
62	535	259	-.36	.09	.75	-2.8	.82	-1.8	c .71	.68	57.6	51.7	Q62
68	484	271	.21	.09	.73	-2.9	.71	-2.9	b .70	.64	65.6	56.2	Q68
71	459	267	.35	.10	.60	-4.4	.59	-4.1	a .72	.63	71.7	57.4	Q71
MEAN	506.9	266.7	.00	.09	1.01	-.1	1.01	.0			59.1	54.9	
S.D.	61.4	5.3	.54	.01	.26	2.6	.29	2.7			9.3	5.1	

Figure 17. Item statistics, in misfit order, of 10-item group 2 comprising items Q59, Q62 to Q65, and Q67 to Q71, after removing misfitting items Q66 and Q61 successively

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
63	520	267	-.18	.09	1.46	4.1	1.51	4.3	A .64	.70	49.8	55.0	Q63
59	580	256	-.81	.08	1.23	2.3	1.29	2.8	B .69	.74	50.9	49.7	Q59
67	584	268	-.65	.08	1.26	2.6	1.28	2.7	C .68	.73	51.4	51.4	Q67
65	404	264	.91	.11	1.12	1.1	1.02	.2	D .61	.61	69.5	64.9	Q65
70	557	271	-.40	.09	.96	-.4	1.01	.2	E .71	.71	60.6	53.4	Q70
69	413	272	.97	.11	.90	-1.0	.71	-2.3	d .66	.61	70.4	65.1	Q69
62	535	259	-.40	.09	.77	-2.5	.85	-1.6	c .73	.71	60.3	53.4	Q62
68	484	271	.21	.10	.77	-2.4	.74	-2.6	b .72	.67	67.1	58.0	Q68
71	459	267	.36	.10	.63	-4.0	.60	-4.1	a .74	.65	71.2	59.2	Q71
MEAN	504.0	266.1	.00	.09	1.01	.0	1.00	.0			61.2	56.7	
S.D.	64.0	5.2	.61	.01	.26	2.6	.29	2.7			8.3	5.2	

Figure 18. Item statistics, in misfit order, of 9-item group 2 comprising items Q59, Q62, Q63, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, and Q64 successively.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
67	584	268	-.73	.09	1.32	3.1	1.32	3.1	A .70	.75	47.5	51.8	Q67
59	580	256	-.90	.09	1.27	2.7	1.30	3.0	B .71	.76	53.0	51.4	Q59
65	404	264	.97	.12	1.23	2.0	1.16	1.2	C .61	.63	66.8	65.7	Q65
70	557	271	-.47	.09	1.03	.4	1.05	.6	D .72	.74	59.8	55.0	Q70
69	413	272	1.03	.12	.92	-.7	.73	-2.1	d .67	.63	71.9	65.9	Q69
62	535	259	-.46	.09	.83	-1.8	.89	-1.1	c .74	.73	62.1	55.0	Q62
68	484	271	.20	.10	.84	-1.6	.79	-2.1	b .73	.69	66.0	59.0	Q68
71	459	267	.37	.10	.68	-3.5	.64	-3.7	a .75	.68	69.3	61.1	Q71
MEAN	502.0	266.0	.00	.10	1.01	.1	.99	-.1			62.0	58.1	
S.D.	67.7	5.5	.70	.01	.22	2.2	.24	2.3			7.8	5.4	

Figure 19. Item statistics, in misfit order, of 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM    (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     67  Q67                     -.73     1.3   A    1.3
  RESPONSE:   1:  3  2  2  1  1   1  1  1  2  3
Z-RESIDUAL:

  RESPONSE:  11:  3  1  2  1  2   1  1  1  3  2
Z-RESIDUAL:                X

  RESPONSE:  21:  1  1  4  2  2   1  1  1  2  2
Z-RESIDUAL:          X                  X

  RESPONSE:  31:  4  1  M  4  1   1  1  1  4  4
Z-RESIDUAL:          X        X        -2  2

  RESPONSE:  41:  1  2  3  1  2   4  3  3  2  3
Z-RESIDUAL:                X

  RESPONSE:  51:  M  2  2  3  1   1  2  4  3  1
Z-RESIDUAL:                   X   X        3 -2

  RESPONSE:  61:  1  1  M  1  3   4  2  2  2  2
Z-RESIDUAL:       X  X

  RESPONSE:  71:  2  1  2  3  4   3  4  2  2  2
Z-RESIDUAL:          X

  RESPONSE:  81:  3  1  1  M  2   3  1  5  2  2
Z-RESIDUAL:

  RESPONSE:  91:  1  2  2  1  1   4  5  4  1  1
Z-RESIDUAL:                   X      X
  RESPONSE: 101:  3  3  4  2  4   1  3  2  2  4
Z-RESIDUAL:

  RESPONSE: 111:  4  4  1  3  2   3  4  2  2  4
Z-RESIDUAL:       2                  2

  RESPONSE: 121:  M  1  1  3  3   5  1  2  2  2
Z-RESIDUAL:             X         2  X

  RESPONSE: 131:  1  1  2  1  3   2  1  2  1  2
Z-RESIDUAL:       X  X     X         X

  RESPONSE: 141:  1  5  1  2  3   2  3  4  1  1
Z-RESIDUAL:       X     X

  RESPONSE: 151:  M  1  2  2  2   3  2  2  2  4
Z-RESIDUAL:

  RESPONSE: 161:  1  5  2  3  1   4  3  1  4  2
Z-RESIDUAL:          2        X

  RESPONSE: 171:  3  5  3  2  5   3  4  3  1  1
Z-RESIDUAL:                   4

  RESPONSE: 181:  3  3  5  1  1   1  1  1  2  2
Z-RESIDUAL:          2  4  X  X

  RESPONSE: 191:  1  1  2  1  1   2  2  2  2  1
Z-RESIDUAL:                            -3
  RESPONSE: 201:  3  2  2  1  1   2  1  4  2  4
Z-RESIDUAL:               -3

  RESPONSE: 211:  2  3  2  4  1   2  3  1  1  3
Z-RESIDUAL:

  RESPONSE: 221:  1  4  1  5  4   2  2  1  3  1
Z-RESIDUAL:                                   X

  RESPONSE: 231:  3  2  3  1  3   1  1  1  2  2
Z-RESIDUAL:             2         X  X

  RESPONSE: 241:  1  2  2  2  5   3  1  3  3  1
Z-RESIDUAL:                   2     -2

  RESPONSE: 251:  4  4  3  1  3   2  2  2  1  1
Z-RESIDUAL:                X               X

  RESPONSE: 261:  2  2  2  1  2   2  1  2  1  2
Z-RESIDUAL:                                X

  RESPONSE: 271:  1  1  2  3
Z-RESIDUAL:
```

Figure 20. Persons' responses to item Q67 in the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
59	580	256	-.94	.09	1.32	3.1	1.34	3.3	A .72	.77	53.7	52.1	Q59
65	404	264	1.00	.12	1.31	2.6	1.22	1.5	B .61	.65	66.5	66.1	Q65
67	568	263	-.74	.09	1.11	1.2	1.08	.9	C .74	.75	52.4	53.4	Q67
70	557	271	-.49	.09	1.07	.8	1.09	1.0	D .73	.75	59.4	55.6	Q70
69	413	272	1.06	.12	.91	-.8	.74	-2.0	d .68	.64	71.7	66.4	Q69
62	535	259	-.49	.09	.85	-1.6	.91	-1.0	c .75	.74	62.6	55.6	Q62
68	484	271	.21	.10	.87	-1.3	.82	-1.8	b .74	.70	66.9	59.8	Q68
71	459	267	.38	.11	.68	-3.4	.64	-3.6	a .76	.69	69.5	61.8	Q71
MEAN	500.0	265.4	.00	.10	1.01	.1	.98	-.2			62.8	58.8	
S.D.	65.4	5.5	.73	.01	.21	2.1	.23	2.1			6.7	5.2	

Figure 21. Item statistics, in misfit order, of the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively, and editing 5 odd persons' responses to item 67

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     59  Q59                    -.94      1.3   A    1.3
   RESPONSE:    1:  2  2  2  2  1   2  2  2  M  3
Z-RESIDUAL:

   RESPONSE:   11:  3  2  5  1  1   1  3  1  3  2
Z-RESIDUAL:                  X         2

   RESPONSE:   21:  1  M  5  1  3   1  M  1  3  3
Z-RESIDUAL:                               X

   RESPONSE:   31:  2  M  4  1  1   2  1  5  2  5
Z-RESIDUAL:                 -2  X         2

   RESPONSE:   41:  1  2  5  M  2   4  M  3  2  4
Z-RESIDUAL:

   RESPONSE:   51:  2  1  4  4  1   1  1  2  1  3
Z-RESIDUAL:                  2  X   X        X

   RESPONSE:   61:  1  1  M  3  2   4  4  M  2  2
Z-RESIDUAL:         X  X               2

   RESPONSE:   71:  4  1  2  3  3   3  2  2  4  1
Z-RESIDUAL:         2  X              -2

   RESPONSE:   81:  M  1  2  1  3   4  1  5  2  3
Z-RESIDUAL:

   RESPONSE:   91:  3  1  3  2  M   4  5  2  2  3
Z-RESIDUAL:                            X        2
   RESPONSE:  101:  3  3  3  3  2   3  1  2  2  4
Z-RESIDUAL:                         2

   RESPONSE:  111:  3  4  1  1  2   M  M  1  2  2
Z-RESIDUAL:

   RESPONSE:  121:  M  4  1  2  M   M  1  1  2  2
Z-RESIDUAL:            3  X            X

   RESPONSE:  131:  1  1  3  1  3   3  1  2  3  2
Z-RESIDUAL:         X  X     X         X

   RESPONSE:  141:  1  M  1  2  1   1  2  2  1  1
Z-RESIDUAL:         X     X

   RESPONSE:  151:  1  1  1  2  1   3  1  3  3  3
Z-RESIDUAL:         X

   RESPONSE:  161:  2  4  5  3  1   4  3  3  2  2
Z-RESIDUAL:               4     X

   RESPONSE:  171:  3  3  2  3  1   3  3  3  2  2
Z-RESIDUAL:

   RESPONSE:  181:  2  1  M  1  1   1  2  2  2  2
Z-RESIDUAL:                  X  X

   RESPONSE:  191:  1  1  2  1  1   2  1  5  1  2
Z-RESIDUAL:
   RESPONSE:  201:  2  1  3  4  1   3  1  2  2  1
Z-RESIDUAL:                                    -2

   RESPONSE:  211:  1  5  2  5  2   3  4  2  4  3
Z-RESIDUAL:                                  3

   RESPONSE:  221:  1  4  2  4  3   1  3  1  2  1
Z-RESIDUAL:                                     X

   RESPONSE:  231:  3  3  2  2  5   M  1  3  2  1
Z-RESIDUAL:                     2      X

   RESPONSE:  241:  2  2  1  2  4   2  3  3  3  3
Z-RESIDUAL:

   RESPONSE:  251:  3  2  4  1  2   2  3  3  1  1
Z-RESIDUAL:                  X               X

   RESPONSE:  261:  2  5  2  3  2   2  2  2  1  2
Z-RESIDUAL:            3                     X

   RESPONSE:  271:  1  2  3  3
Z-RESIDUAL:
```

Figure 22. Persons’ responses to item Q59 in the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively, and editing 5 odd persons’ responses to item Q67

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
65	404	264	1.02	.12	1.34	2.8	1.23	1.6	A .61	.66	66.5	66.8	Q65
59	562	252	-.88	.09	1.17	1.7	1.17	1.8	B .74	.77	54.7	52.8	Q59
67	568	263	-.77	.09	1.14	1.4	1.11	1.2	C .74	.76	52.8	53.8	Q67
70	557	271	-.52	.09	1.09	.9	1.10	1.0	D .74	.76	59.8	56.1	Q70
62	535	259	-.52	.10	.89	-1.1	.96	-.4	d .75	.75	62.6	56.1	Q62
69	413	272	1.08	.12	.93	-.7	.74	-1.9	c .69	.65	71.7	67.1	Q69
68	484	271	.20	.10	.88	-1.1	.82	-1.7	b .74	.71	68.6	60.7	Q68
71	459	267	.38	.11	.69	-3.3	.64	-3.5	a .76	.70	69.9	62.6	Q71
MEAN	497.8	264.9	.00	.10	1.02	.1	.97	-.3			63.3	59.5	
S.D.	62.9	6.5	.73	.01	.19	1.9	.20	1.8			6.6	5.3	

Figure 23. Item statistics, in misfit order, of the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively; and editing 5 odd persons' responses to item Q67, and 4 odd persons' responses to item Q59

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM    (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     65  Q65                        1.02     1.3    A    1.2
  RESPONSE:     1:   1   2   2   1   1    1   2   1   2   2
Z-RESIDUAL:                                   2

  RESPONSE:    11:   2   1   2   1   1    1   1   1   3   2
Z-RESIDUAL:                      X

  RESPONSE:    21:   2   1   2   1   2    1   2   1   1   1
Z-RESIDUAL:              X                        X

  RESPONSE:    31:   3   M   M   1   1    1   2   1   1   1
Z-RESIDUAL:                          X

  RESPONSE:    41:   1   2   3   1   1    3   M   3   1   1
Z-RESIDUAL:                      X

  RESPONSE:    51:   1   1   3   1   1    1   1   2   1   4
Z-RESIDUAL:                  2       X    X               X   3

  RESPONSE:    61:   1   1   M   1   2    3   1   1   2   2
Z-RESIDUAL:          X   X

  RESPONSE:    71:   1   1   1   1   M    1   3   2   1   2
Z-RESIDUAL:              X                                3

  RESPONSE:    81:   1   2   1   1   2    2   1   2   1   2
Z-RESIDUAL:              3

  RESPONSE:    91:   1   1   2   1   1    2   5   1   2   1
Z-RESIDUAL:                          X        X
 RESPONSE:    101:   2   1   2   2   3    1   5   2   2   3
Z-RESIDUAL:                                   5

 RESPONSE:    111:   1   4   2   1   1    1   2   2   2   2
Z-RESIDUAL:                  3

 RESPONSE:    121:   2   1   1   2   1    1   1   1   2   1
Z-RESIDUAL:          2       X                X

 RESPONSE:    131:   1   1   1   1   1    1   1   2   1   2
Z-RESIDUAL:          X   X       X            X

 RESPONSE:    141:   1   5   1   2   1    1   2   2   1   1
Z-RESIDUAL:          X   2   X

 RESPONSE:    151:   M   1   1   2   1    3   1   2   3   4
Z-RESIDUAL:                                               2

 RESPONSE:    161:   1   1   1   2   1    4   3   1   1   1
Z-RESIDUAL:                          X

 RESPONSE:    171:   2   1   2   2   M    1   2   2   1   1
Z-RESIDUAL:

 RESPONSE:    181:   1   1   1   1   1    1   1   2   2   1
Z-RESIDUAL:                  X   X   X

 RESPONSE:    191:   1   1   1   1   2    2   1   1   2   1
Z-RESIDUAL:                          4           -2
 RESPONSE:    201:   1   1   1   1   1    1   1   3   2   1
Z-RESIDUAL:                     -2

 RESPONSE:    211:   1   2   1   4   1    2   1   1   1   2
Z-RESIDUAL:

 RESPONSE:    221:   1   3   2   2   1    1   2   1   2   1
Z-RESIDUAL:                                               X

 RESPONSE:    231:   2   1   1   1   1    1   1   1   1   1
Z-RESIDUAL:                               X   X

 RESPONSE:    241:   1   2   1   1   2    1   M   M   2   1
Z-RESIDUAL:

 RESPONSE:    251:   4   2   1   1   3    2   2   1   1   1
Z-RESIDUAL:          3           X                    X

 RESPONSE:    261:   1   1   1   1   2    1   1   1   1   3
Z-RESIDUAL:                                           X

 RESPONSE:    271:   1   1   2   M
Z-RESIDUAL:
```

Figure 24. Persons' responses to item Q65 in the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively, and editing 5 odd persons' responses to item Q67, and 4 odd persons' responses to item Q59

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
59	562	252	-.93	.10	1.21	2.1	1.20	2.0	A .75	.78	54.5	53.5	Q59
67	568	263	-.82	.09	1.19	1.9	1.17	1.7	B .74	.77	47.8	53.7	Q67
70	557	271	-.56	.10	1.12	1.3	1.12	1.3	C .74	.77	57.1	56.1	Q70
65	383	257	1.22	.13	1.09	.8	.85	-1.0	D .65	.65	68.1	67.9	Q65
62	535	259	-.56	.10	.93	-.7	1.00	.1	d .75	.76	59.0	56.1	Q62
69	413	272	1.09	.12	.94	-.5	.76	-1.8	c .69	.66	72.0	67.5	Q69
68	484	271	.19	.11	.90	-1.0	.83	-1.6	b .75	.72	68.9	61.3	Q68
71	459	267	.37	.11	.70	-3.2	.65	-3.4	a .77	.71	70.6	63.2	Q71
MEAN	495.1	264.0	.00	.11	1.01	.1	.95	-.3			62.3	59.9	
S.D.	67.0	7.0	.79	.01	.16	1.7	.19	1.8			8.3	5.5	

Figure 25. Item statistics, in misfit order, of the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively; and editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	18.5	100.0%		100.0%
Raw variance explained by measures	=	10.5	56.8%		58.0%
Raw variance explained by persons	=	6.8	36.8%		37.6%
Raw Variance explained by items	=	3.7	20.0%		20.4%
Raw unexplained variance (total)	=	8.0	43.2%	100.0%	42.0%
Unexplned variance in 1st contrast	=	1.9	10.3%	23.9%	
Unexplned variance in 2nd contrast	=	1.3	7.1%	16.3%	
Unexplned variance in 3rd contrast	=	1.2	6.3%	14.7%	
Unexplned variance in 4th contrast	=	1.0	5.5%	12.8%	
Unexplned variance in 5th contrast	=	.9	5.0%	11.6%	

Figure 26. Standardized residual variance of the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively; and editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	921	44	-3.53	-3.51	1.08	1.02	NONE	(-3.87)	1
2	2	734	35	-1.80	-1.81	.91	.79	-2.71	-1.57	2
3	3	301	14	-.55	-.57	.98	.97	-.26	.24	3
4	4	111	5	.63	.44	.85	.85	.93	1.62	4
5	5	45	2	.93	1.47	1.62	1.64	2.04	(3.34)	5
MISSING		51	2	-2.01						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 27. Category structure of the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively; and

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                         |
A      |                                                      555|
B   .8 +1                                                   55   +
I      | 11                                             55     |
L      |   1                                             5       |
I      |    11                                          5        |
T   .6 +      1      222222222                        55         +
Y      |       1   22         22                     5           |
    .5 +        1*2             2                   5            +
O      |        2 1              2 333333    4444445             |
F   .4 +      22   1             3*2     3344     544            +
       |     2      11         33   2    4433    5   44          |
R      |   22         1      33      2  4    3 55      44        |
E      | 22            11   3         *4      *3         44      |
S   .2 +2               133         4 22    5  3          444   +
P      |                3311       44    2255    33           44 |
O      |             333    111 444      5522      333          4|
N      |       333333       444*1111 5555    2222     33333      |
S   .0 +********************55555555*11111111111*****************+
E      -+------+------+------+------+------+------+------+------+-
       -4     -3     -2     -1      0      1      2      3      4
        PERSON [MINUS] ITEM MEASURE
```

Figure 28. Category probability curves of the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively; and editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.89	.11	M	-1.06	.19	.17	.22	.76	126	.4498	.6255	.27	59	Q59
F	-.46	.11	M	-.87	.20	.41	.23	1.79	125	.0759	.1702	-.33	62	Q62
F	1.10	.14	M	1.71	.29	-.61	.33	-1.86	109	.0660	.0281	.32	65	Q65
F	-.77	.11	M	-.98	.20	.21	.22	.94	122	.3482	.3977	.17	67	Q67
F	.16	.12	M	.28	.23	-.12	.26	-.46	124	.6470	.6455	-.07	68	Q68
F	1.09	.14	M	1.09	.26	.00	.29	.00	124	1.000	.7729	-.06	69	Q69
F	-.56	.11	M	-.62	.20	.06	.23	.26	126	.7923	.2894	-.07	70	Q70
F	.24	.12	M	.89	.25	-.66	.28	-2.39	119	.0185	.0124	-.60	71	Q71

Figure 29. Gender DIF of the 8-item group 2 comprising items Q59, Q62, Q65, and Q67 to Q71, after removing misfitting items Q66, Q61, Q64, and Q63 successively; and editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.84	.11	M	-.92	.19	.08	.22	.36	126	.7168	.9500	.11	59	Q59
F	-.42	.11	M	-.73	.19	.32	.22	1.42	125	.1585	.1370	-.19	62	Q62
F	1.11	.14	M	1.77	.29	-.66	.32	-2.06	109	.0421	.0785	-.10	65	Q65
F	-.72	.11	M	-.84	.19	.13	.22	.58	122	.5642	.6942	-.16	67	Q67
F	.19	.12	M	.38	.22	-.19	.25	-.75	124	.4549	.6834	.01	68	Q68
F	1.12	.14	M	1.17	.25	-.05	.29	-.16	124	.8753	.9137	-.73	69	Q69
F	-.49	.11	M	-.49	.20	.00	.23	.00	126	1.000	.8793	.24	70	Q70

Figure 30. Gender DIF of the 7-item group 2 comprising items Q59, Q62, Q65, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing DIF item Q71

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.66	.11	M	-.66	.19	.00	.22	.00	126	1.000	.7547	.20	59	Q59
F	-.22	.11	M	-.49	.20	.27	.23	1.18	124	.2397	.2165	-.08	62	Q62
F	-.55	.11	M	-.60	.20	.05	.22	.22	122	.8267	.9600	.16	67	Q67
F	.39	.12	M	.65	.22	-.26	.25	-1.03	124	.3034	.4519	-.43	68	Q68
F	1.33	.14	M	1.45	.26	-.12	.29	-.43	124	.6703	.9184	-.38	69	Q69
F	-.29	.11	M	-.24	.20	-.05	.23	-.24	126	.8143	.8921	.14	70	Q70

Figure 31. Gender DIF of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
67	568	263	-.55	.09	1.10	1.0	1.06	.7	A .76	.76	54.7	54.5	Q67
59	562	252	-.66	.10	1.07	.8	1.06	.7	B .77	.78	54.9	53.9	Q59
70	557	271	-.29	.10	1.04	.4	1.03	.4	C .75	.76	59.1	56.4	Q70
69	413	272	1.35	.12	1.01	.2	.84	-1.2	c .67	.66	65.5	67.3	Q69
68	484	271	.45	.11	.94	-.5	.86	-1.3	b .74	.72	67.1	60.6	Q68
62	535	259	-.29	.10	.88	-1.2	.92	-.8	a .76	.76	63.8	56.4	Q62
MEAN	519.8	264.7	.00	.10	1.01	.1	.96	-.3			60.9	58.2	
S.D.	55.4	7.4	.70	.01	.08	.8	.09	.9			4.9	4.6	

Figure 32. Item statistics of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                               -- Empirical --    Modeled
Total raw variance in observations     =       13.8 100.0%         100.0%
  Raw variance explained by measures   =        7.8  56.7%          57.2%
    Raw variance explained by persons  =        5.3  38.1%          38.5%
    Raw Variance explained by items    =        2.6  18.6%          18.7%
  Raw unexplained variance (total)     =        6.0  43.3% 100.0%   42.8%
    Unexplned variance in 1st contrast =        1.7  12.1%  27.9%
    Unexplned variance in 2nd contrast =        1.3   9.4%  21.6%
    Unexplned variance in 3rd contrast =        1.2   8.7%  20.0%
    Unexplned variance in 4th contrast =        1.0   7.0%  16.2%
    Unexplned variance in 5th contrast =         .9   6.1%  14.2%
```

Figure 33. Standardized residual variance of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
69	413	272	1.35	.12	1.01	.2	.84	-1.2	.73	.69	65.5	67.3	Q69
67	568	263	-.55	.09	1.10	1.0	1.06	.7	.75	.77	54.7	54.5	Q67
62	535	259	-.29	.10	.88	-1.2	.92	-.8	.76	.78	63.8	56.4	Q62
70	557	271	-.29	.10	1.04	.4	1.03	.4	.77	.77	59.1	56.4	Q70
68	484	271	.45	.11	.94	-.5	.86	-1.3	.78	.74	67.1	60.6	Q68
59	562	252	-.66	.10	1.07	.8	1.06	.7	.78	.79	54.9	53.9	Q59
MEAN	519.8	264.7	.00	.10	1.01	.1	.96	-.3			60.9	58.2	
S.D.	55.4	7.4	.70	.01	.08	.8	.09	.9			4.9	4.6	

Figure 34. Item statistics, in point-biserial correlation order, of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	629	40	-3.29	-3.28	1.10	1.03	NONE	(-3.86)	1
2	2	565	36	-1.68	-1.68	.94	.88	-2.70	-1.56	2
3	3	256	16	-.50	-.48	.96	.95	-.25	.25	3
4	4	98	6	.66	.47	.84	.83	.96	1.61	4
5	5	40	3	1.11	1.45	1.35	1.35	2.00	(3.31)	5
MISSING		31	2	-1.18						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 35. Category structure of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons'

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

responses to item Q65; removing 2 DIF items Q71 and Q65

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                        5|
A      |                                                      55 |
B   .8 +1                                                   55   +
I      | 11                                               55     |
L      |   1                                             5       |
I      |    11                                         55        |
T   .6 +      1      222222222                        5          +
Y      |       1   22          22                    5           |
    .5 +        1*2              2                  5            +
O      |        2 1               2 333333     4444 5            |
F   .4 +      22   1              3*2      33444    *44          +
       |     2      11         33   2      4433   55   44        |
R      |   22         1        3      2  4     3 5        44     |
E      | 22            11   33         **       *3          44   |
S   .2 +2                133          4  2    5  33          44  +
P      |                33111       44     2255     3          444 |
O      |             333     11 444       5522      333          4|
N      |       333333      444*1111 5555    2222     33333      |
S   .0 +********************55555555*111111111111****************+
E      -+------+------+------+------+------+------+------+------+-
       -4     -3     -2     -1      0      1      2      3      4
        PERSON [MINUS] ITEM MEASURE
```

Figure 36. Category probability curves of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     SUMMARY OF 238 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE      COUNT     MEASURE  ERROR       MNSQ   ZSTD  MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN      12.2        5.9       -1.73    .68       1.00    -.1   .97    -.1 |
| S.D.       4.1         .4        1.59    .18        .75    1.2   .73    1.2 |
| MAX.      26.0        6.0        2.56   1.15       3.85    3.2  3.74    3.0 |
| MIN.       5.0        4.0       -4.50    .49        .06   -3.1   .06   -3.0 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .78 TRUE SD    1.39  SEPARATION  1.78  PERSON RELIABILITY  .76 |
|MODEL RMSE    .71 TRUE SD    1.43  SEPARATION  2.02  PERSON RELIABILITY  .80 |
| S.E. OF PERSON MEAN = .10                                                   |
-------------------------------------------------------------------------------
  MAXIMUM EXTREME SCORE:       1 PERSON
  MINIMUM EXTREME SCORE:      34 PERSON
      LACKING RESPONSES:       1 PERSON
     SUMMARY OF 6 MEASURED (NON-EXTREME) ITEM
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE      COUNT     MEASURE  ERROR       MNSQ   ZSTD  MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     519.8      264.7         .00    .10       1.01     .1   .96    -.3 |
| S.D.      55.4        7.4         .70    .01        .08     .8   .09     .9 |
| MAX.     568.0      272.0        1.35    .12       1.10    1.0  1.06     .7 |
| MIN.     413.0      252.0        -.66    .09        .88   -1.2   .84   -1.3 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .10 TRUE SD     .69  SEPARATION  6.70  ITEM   RELIABILITY  .98 |
|MODEL RMSE    .10 TRUE SD     .69  SEPARATION  6.81  ITEM   RELIABILITY  .98 |
| S.E. OF ITEM MEAN = .31                                                     |
-------------------------------------------------------------------------------
                          DELETED: 6 ITEM
```

Figure 37. Separations and reliabilities of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    4             .  +
                     |                             Q69 .45
                     |
                     |
                     |
                     |
    3                +                             Q68 .45
                     |
                     |
                  .  |
                  .  |                    Q69 .35
                     |                             Q62 .45
                                                   Q70 .45
    2                +                             Q67 .45
                  .  |                             Q59 .45
                  .  |
                    T|
                  .  |T                   Q68 .35
                  .  |
    1                +
                 .#  |           Q69 .25
                 .#  |S                   Q62 .35
                                          Q70 .35
                  #  |
                     |                    Q59 .35
                                          Q67 .35
               .###  |
    0          ####  +M          Q68 .25
                    S|
               ####  |
                     |
              .####  |S
              .####  |           Q62 .25
                                 Q70 .25
   -1             .  +
            .######  |           Q59 .25
                                 Q67 .25
                     |T
                  .  |  Q69 .15
         .######### M|
                     |
   -2      .#######  +
                  .  |
                     |
             .#####  |  Q68 .15
                  .  |
                     |
   -3         .####  +
                  #  |  Q62 .15
                        Q70 .15
                    S|
                     |  Q59 .15
                        Q67 .15
           .#######  |
                  .  |
   -4                +
                  .  |
                  .  |
            #######  |
                     |
                    T|
   -5  .###########  +
               <less>|
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 38. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
59	68	-0.3624
59	69	-0.3524
67	70	-0.3196
62	70	-0.294
62	68	-0.2303
62	67	-0.2171
67	68	-0.2171
59	70	-0.211
62	69	-0.2083
59	67	-0.1906
67	69	-0.1873
68	70	-0.1153
69	70	-0.0955
59	62	-0.0746
68	69	0.1485

Figure 38. Correlations of residuals for each item pair of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-5    -4    -3    -2    -1     0     1     2     3     4     5
|-----+-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   ITEM
1              1     :       2     :    3   :   4    :    5 5   69  Q69
|                                                           |
|                                                           |
1         1    :       2      :   3   :   4     :    5      5   68  Q68
|                                                           |
|                                                           |
1    1     :       2     :    3   :   4    :    5           5   62  Q62
1    1     :       2     :    3   :   4    :    5           5   70  Q70
1  1     :       2     :    3   :   4     :    5            5   67  Q67
1  1     :       2     :    3   :   4    :    5             5   59  Q59
|-----+-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   ITEM
-5    -4    -3    -2    -1     0     1     2     3     4     5

3  2    2   1  1  2 2  2 11 1 11
211112 13  34 26 12 92 0133 2 21 344 21 11  21              1  PERSON
     S           M           S           T
0 20   30     40 50 60 70  80 90          99                   PERCENTILE
```

Figure 39. Construct keymap of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
    4             .  +
                     |
                     |
                     |
                     |
                     |
    3                +
                     |
                     |
                  .  |
                  .  |
                     |
    2                +
                  .  |
                  .  |
                    T|
                  .  |T Q69
                  .  |
    1                +
                 .#  |
                 .#  |S
                  #  |  Q68
                     |
               .###  |
    0          ####  +M
                    S|
               ####  |  Q62    Q70
                     |  Q67
              .####  |S Q59
              .####  |
   -1             .  +
            .######  |
                     |T
                  .  |
         .######### M|
                     |
   -2      .#######  +
                  .  |
                     |
             .#####  |
                  .  |
                     |
   -3         .####  +
                  #  |
                    S|
                     |
          .#######   |
                  .  |
   -4                +
                  .  |
                  .  |
            #######  |
                     |
                    T|
   -5  .###########  +
              <less>|<frequ>
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 40. Person-item map of the 6-item group 2 comprising items Q59, Q62, and Q67-Q70 after removing misfitting items Q66, Q61, Q64, and Q63 successively; editing 5 odd persons' responses to item Q67, 4 odd persons' responses to item Q59, and 7 odd persons' responses to item Q65; removing 2 DIF items Q71 and Q65

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
57	576	259	-.38	.10	1.41	3.8	1.37	3.5	A .73	.79	52.6	58.0	Q57
58	533	259	.06	.11	1.40	3.5	1.28	2.6	B .71	.77	54.7	60.8	Q58
60	526	268	.32	.11	1.08	.8	1.04	.4	C .75	.75	64.7	62.5	Q60
52	578	266	-.26	.10	.97	-.3	1.07	.7	D .78	.78	62.6	58.3	Q52
56	569	266	-.16	.10	.95	-.4	.97	-.2	E .79	.78	71.0	59.2	Q56
53	502	268	.61	.11	.96	-.4	.89	-1.0	d .76	.74	67.1	64.4	Q53
51	552	269	.04	.10	.78	-2.3	.80	-2.2	c .79	.77	65.0	60.9	Q51
55	572	271	-.11	.10	.74	-2.8	.72	-3.2	b .82	.78	72.8	60.1	Q55
54	576	273	-.12	.10	.69	-3.5	.68	-3.7	a .82	.78	72.1	60.0	Q54
MEAN	553.8	266.6	.00	.10	1.00	-.2	.98	-.3			64.7	60.5	
S.D.	25.9	4.5	.29	.00	.25	2.4	.23	2.3			6.8	1.9	

Figure 41. Item statistics, in misfit order, of the 9-item group 3 comprising items Q51 to Q58, and Q60

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
58	533	259	.02	.11	1.81	6.5	1.76	6.1	A .68	.79	51.5	62.9	Q58
60	526	268	.30	.11	1.12	1.2	1.06	.6	B .76	.77	62.6	64.4	Q60
52	578	266	-.34	.11	.94	-.6	1.01	.2	C .80	.80	65.7	60.5	Q52
53	502	268	.61	.12	.98	-.2	.89	-1.0	D .78	.76	68.5	65.5	Q53
56	569	266	-.23	.11	.91	-.9	.93	-.7	d .81	.80	71.6	61.5	Q56
51	552	269	.00	.11	.78	-2.4	.79	-2.2	c .81	.79	67.6	62.9	Q51
55	572	271	-.17	.11	.78	-2.4	.74	-2.8	b .83	.80	72.9	61.9	Q55
54	576	273	-.18	.11	.68	-3.7	.70	-3.5	a .84	.80	73.4	61.9	Q54
MEAN	551.0	267.5	.00	.11	1.00	-.3	.99	-.4			66.7	62.7	
S.D.	26.1	3.9	.29	.00	.33	2.9	.32	2.8			6.7	1.5	

Figure 42. Item statistics, in misfit order, of the 8-item group 3 comprising items Q51 to Q58, and Q60, after removing misfitting item Q57

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
60	526	268	.36	.12	1.35	3.1	1.28	2.5	A .77	.81	65.4	67.2	Q60
53	502	268	.72	.12	1.10	1.0	.99	.0	B .80	.80	72.2	67.5	Q53
52	578	266	-.40	.12	1.00	.0	1.03	.3	C .83	.84	65.9	64.2	Q52
56	569	266	-.27	.12	1.01	.2	.99	-.1	D .84	.83	72.8	64.8	Q56
55	572	271	-.20	.12	.90	-1.0	.83	-1.8	c .85	.83	74.6	65.4	Q55
51	552	269	.00	.12	.86	-1.4	.89	-1.0	b .83	.82	70.1	66.3	Q51
54	576	273	-.21	.12	.75	-2.7	.78	-2.3	a .85	.83	75.9	65.4	Q54
MEAN	553.6	268.7	.00	.12	.99	-.1	.97	-.3			71.0	65.8	
S.D.	27.0	2.4	.37	.00	.18	1.7	.15	1.5			3.8	1.1	

Figure 43. Item statistics, in misfit order, of the 7-item group 3 comprising items Q51 to Q56, and Q60, after removing misfitting items Q57 and Q58

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	21.3	100.0%		100.0%
Raw variance explained by measures	=	14.3	67.1%		66.8%
Raw variance explained by persons	=	13.4	63.1%		62.8%
Raw Variance explained by items	=	.9	4.0%		4.0%
Raw unexplained variance (total)	=	7.0	32.9%	100.0%	33.2%
Unexplned variance in 1st contrast	=	1.7	8.2%	25.0%	
Unexplned variance in 2nd contrast	=	1.3	5.9%	18.0%	
Unexplned variance in 3rd contrast	=	1.2	5.6%	17.1%	
Unexplned variance in 4th contrast	=	1.0	4.8%	14.7%	
Unexplned variance in 5th contrast	=	1.0	4.6%	14.1%	

Figure 44. Standardized residual variance of the 7-item group 3 comprising items Q51 to Q56, and Q60, after removing misfitting items Q57 and Q58

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
60	526	268	.36	.12	1.35	3.1	1.28	2.5	.79	.83	65.4	67.2	Q60
53	502	268	.72	.12	1.10	1.0	.99	.0	.83	.83	72.2	67.5	Q53
56	569	266	-.27	.12	1.01	.2	.99	-.1	.85	.85	72.8	64.8	Q56
55	572	271	-.20	.12	.90	-1.0	.83	-1.8	.85	.85	74.6	65.4	Q55
52	578	266	-.40	.12	1.00	.0	1.03	.3	.85	.85	65.9	64.2	Q52
51	552	269	.00	.12	.86	-1.4	.89	-1.0	.86	.85	70.1	66.3	Q51
54	576	273	-.21	.12	.75	-2.7	.78	-2.3	.88	.84	75.9	65.4	Q54
MEAN	553.6	268.7	.00	.12	.99	-.1	.97	-.3			71.0	65.8	
S.D.	27.0	2.4	.37	.00	.18	1.7	.15	1.5			3.8	1.1	

Figure 45. Item statistics, in point biserial correlation order, of the 7-item group 3 comprising items Q51 to Q56, and Q60, after removing misfitting items Q57 and Q58

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	600	32	-4.65	-4.65	1.19	.99	NONE	(-5.38)	1
2	2	777	41	-2.33	-2.31	.82	.87	-4.26	-2.35	2
3	3	346	18	-.14	-.17	.86	.87	-.41	.62	3
4	4	107	6	1.59	1.43	.95	1.04	1.85	2.40	4
5	5	51	3	2.52	2.78	1.35	1.65	2.83	(4.14)	5
MISSING		20	1	-2.20						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 46. Category structure of the 7-item group 3 comprising items Q51 to Q56, and Q60, after removing misfitting items Q57 and Q58

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                         5555|
B      |                                                       55    |
A      |1                                                    55      |
B   .8 + 11                                                55        +
I      |   1           2222222                            5          |
L      |    1        22       22                         5           |
I      |     11     2           2                       5            |
T   .6 +       1   2             2       333           5             +
Y      |        1 2               2    33   33        5              |
    .5 +         *                 2 3        3      5               +
O      |        2 1                 3*         3  444 5              |
F   .4 +       2   1               3  2         *4   *4              +
       |      2     1             3    2      44 3  5  44            |
R      |    22       1           3      2    4    35     4           |
E      |   2          1        3         2  4     53      44         |
S   .2 + 22            1     33           24     5  3       4        +
P      |2               11 33            4422   5    33      44      |
O      |                 3*11         44     2*5       3       444   |
N      |            33333    1111 4444     555 222      3333      4444|
S   .0 +*********************************1111111*********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 47. Category probability curves of the 7-item group 3 comprising items Q51 to Q56, and Q60, after removing misfitting items Q57 and Q58

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.04	.14	M	-.11	.23	.15	.27	.55	135	.5832	.9172	.29	51	Q51
F	-.25	.14	M	-.80	.22	.55	.26	2.10	139	.0374	.0080	.55	52	Q52
F	.57	.14	M	1.18	.25	-.61	.29	-2.09	132	.0386	.1833	-.26	53	Q53
F	-.09	.14	M	-.55	.22	.46	.26	1.75	139	.0828	.2892	.44	54	Q54
F	-.25	.13	M	-.03	.23	-.22	.27	-.83	136	.4075	.5336	.01	55	Q55
F	-.20	.14	M	-.45	.23	.25	.26	.95	136	.3456	.4966	.06	56	Q56
F	.17	.14	M	.92	.24	-.75	.28	-2.67	134	.0084	.0268	-.34	60	Q60

Figure 48. Gender DIF of the 7-item group 3 comprising items Q51 to Q56, and Q60, after removing misfitting items Q57 and Q58

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.06	.15	M	.02	.24	.04	.28	.14	136	.8873	.6410	.29	51	Q51
F	-.25	.14	M	-.70	.23	.45	.27	1.64	140	.1034	.0752	.36	52	Q52
F	.67	.15	M	1.41	.26	-.74	.30	-2.45	132	.0158	.2237	-.20	53	Q53
F	-.07	.14	M	-.43	.23	.36	.27	1.32	140	.1899	.2851	-.25	54	Q54
F	-.25	.14	M	.13	.24	-.38	.28	-1.36	137	.1768	.2734	-.08	55	Q55
F	-.19	.14	M	-.32	.24	.13	.28	.48	137	.6355	.9904	-.58	56	Q56

Figure 49. Gender DIF of the 6-item group 3 comprising items Q51 to Q56, after removing misfitting items Q57 and Q58 as well as DIF item Q60

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.25	.15	M	.30	.25	-.05	.29	-.18	136	.8568	.4417	.05	51	Q51
F	-.12	.15	M	-.45	.24	.34	.28	1.21	140	.2281	.0095	.73	52	Q52
F	.08	.15	M	-.17	.24	.25	.28	.88	140	.3790	.7398	-.07	54	Q54
F	-.12	.15	M	.41	.24	-.53	.28	-1.85	138	.0659	.1079	-.55	55	Q55
F	-.06	.15	M	-.06	.24	.00	.28	.00	137	1.000	.6581	-.93	56	Q56

Figure 50. Gender DIF of the 5-item group 3 comprising items Q51, Q52, Q54, Q55, and Q56, after removing misfitting items Q57 and Q58 as well as DIF items Q60 and Q53

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
55	572	271	.02	.13	1.10	1.0	.95	-.4	A .86	.86	71.4	68.4	Q55
52	578	266	-.21	.13	1.06	.6	1.04	.4	B .86	.86	66.5	67.2	Q52
56	569	266	-.06	.13	1.03	.3	1.06	.5	C .86	.86	72.7	68.2	Q56
51	552	269	.25	.13	.89	-1.1	.89	-1.1	b .85	.85	69.4	68.4	Q51
54	576	273	.01	.13	.85	-1.5	.89	-1.0	a .87	.86	75.0	68.4	Q54
MEAN	569.4	269.0	.00	.13	.98	-.2	.96	-.3			71.0	68.1	
S.D.	9.2	2.8	.15	.00	.10	1.0	.07	.7			2.9	.5	

Figure 51. Item statistics of the 5-item group 3 comprising items Q51, Q52, Q54, Q55, and Q56, after removing misfitting items Q57 and Q58 as well as DIF items Q60 and Q53

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	16.8	100.0%		100.0%
Raw variance explained by measures	=	11.8	70.3%		69.9%
Raw variance explained by persons	=	11.5	68.5%		68.1%
Raw Variance explained by items	=	.3	1.8%		1.8%
Raw unexplained variance (total)	=	5.0	29.7%	100.0%	30.1%
Unexplned variance in 1st contrast	=	1.7	10.4%	34.9%	
Unexplned variance in 2nd contrast	=	1.4	8.1%	27.4%	
Unexplned variance in 3rd contrast	=	1.1	6.3%	21.3%	
Unexplned variance in 4th contrast	=	.8	4.9%	16.6%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 52. Standardized residual variance of the 5-item group 3 comprising items Q51, Q52, Q54, Q55, and Q56, after removing misfitting items Q57 and Q58 as well as DIF items Q60 and Q53

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
55	572	271	.02	.13	1.10	1.0	.95	-.4	.85	.87	71.4	68.4	Q55
51	552	269	.25	.13	.89	-1.1	.89	-1.1	.87	.86	69.4	68.4	Q51
52	578	266	-.21	.13	1.06	.6	1.04	.4	.87	.88	66.5	67.2	Q52
54	576	273	.01	.13	.85	-1.5	.89	-1.0	.88	.86	75.0	68.4	Q54
56	569	266	-.06	.13	1.03	.3	1.06	.5	.88	.87	72.7	68.2	Q56
MEAN	569.4	269.0	.00	.13	.98	-.2	.96	-.3			71.0	68.1	
S.D.	9.2	2.8	.15	.00	.10	1.0	.07	.7			2.9	.5	

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 53. Item statistics, in point-biserial correlation order, of the 5-item group 3 comprising items Q51, Q52, Q54, Q55, and Q56, after removing misfitting items Q57 and Q58 as well as DIF items Q60 and Q53

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     390  29| -4.98 -5.00|  1.21   .99||  NONE   |( -6.10)| 1
|  2   2     573  43| -2.73 -2.71|   .87   .89||  -5.00  |  -2.80 | 2
|  3   3     259  19|  -.03  -.05|   .82   .79||   -.59  |    .73 | 3
|  4   4      81   6|  2.11  1.95|   .91  1.05||   2.16  |   2.82 | 4
|  5   5      42   3|  3.35  3.54|  1.31  1.80||   3.42  |(  4.69)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      14   1| -2.71      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 54. Category structure of the 5-item group 3 comprising items Q51, Q52, Q54, Q55, and Q56, after removing misfitting items Q57 and Q58 as well as DIF items Q60 and Q53

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                             |
B      |1                                                            |
A      | 11                                                          |
B   .8 +   1              2222222                                  55+
I      |    11          22       22                               5  |
L      |      1       22           2                             5   |
I      |       1     2              22       33333              5    |
T   .6 +        1   2                 2    33     3            5     +
Y      |         1 2                   2  3        3          5      |
    .5 +          *                     *3          3    44  5       +
O      |         2 1                   3 2           3444  4*        |
F   .4 +        2   1                 3   2          43    5 44      +
       |       2     1               3     2        4  3   5   4     |
R      |      2       1             3       2     44    3 5     4    |
E      |    22         11          3         2   4       *       44  |
S   .2 +   2             1       33           2 4       5 3        4 +
P      | 22               11   33             4*2     55   33       4|
O      |2                   1*3             44   22  5       3       |
N      |                33333 11111     4444     55**22       3333   |
S   .0 +*****************************************111111**************+
E      -+---------+---------+---------+---------+---------+---------+-
       -7        -5        -3        -1         1         3         5
        PERSON [MINUS] ITEM MEASURE
```

Figure 55. Category probability curves of the 5-item group 3 comprising items Q51, Q52, Q54, Q55, and Q56, after removing misfitting items Q57 and Q58 as well as DIF items Q60 and Q53

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 232 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	11.4	4.9	-1.94	.91	.95	-.4	.95	-.4
S.D.	4.1	.4	2.65	.18	1.22	1.7	1.22	1.7
MAX.	24.0	5.0	4.94	2.34	9.90	4.6	9.90	4.6
MIN.	2.0	1.0	-6.39	.61	.00	-4.6	.00	-4.6

REAL RMSE 1.07 TRUE SD 2.42 SEPARATION 2.27 PERSON RELIABILITY .84
MODEL RMSE .92 TRUE SD 2.48 SEPARATION 2.69 PERSON RELIABILITY .88
S.E. OF PERSON MEAN = .17

MINIMUM EXTREME SCORE: 41 PERSON
LACKING RESPONSES: 1 PERSON

SUMMARY OF 5 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	569.4	269.0	.00	.13	.98	-.2	.96	-.3
S.D.	9.2	2.8	.15	.00	.10	1.0	.07	.7
MAX.	578.0	273.0	.25	.13	1.10	1.0	1.06	.5
MIN.	552.0	266.0	-.21	.13	.85	-1.5	.89	-1.1

REAL RMSE .13 TRUE SD .08 SEPARATION .59 ITEM RELIABILITY .26
MODEL RMSE .13 TRUE SD .08 SEPARATION .63 ITEM RELIABILITY .28
S.E. OF ITEM MEAN = .07

Figure 56. Separations and reliabilities of the 5-item group 3 comprising items Q51, Q52, Q54, Q55, and Q56, after removing misfitting items Q57 and Q58 as well as DIF items Q60 and Q53

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 21: Social Interaction's work-in-progress figures and tables

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                   -- Empirical --    Modeled
Total raw variance in observations     =           52.6 100.0%         100.0%
  Raw variance explained by measures   =           28.6  54.4%          54.9%
    Raw variance explained by persons  =           19.7  37.5%          37.9%
    Raw Variance explained by items    =            8.9  16.8%          17.0%
  Raw unexplained variance (total)     =           24.0  45.6% 100.0%   45.1%
    Unexplned variance in 1st contrast =            3.2   6.0%  13.2%
    Unexplned variance in 2nd contrast =            2.2   4.1%   9.0%
    Unexplned variance in 3rd contrast =            1.8   3.4%   7.5%
    Unexplned variance in 4th contrast =            1.7   3.2%   6.9%
    Unexplned variance in 5th contrast =            1.4   2.7%   5.9%
```

Figure 1. Standardized residual variance of initial Social Interaction dimension

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM
1	.62	.20	.89	.80	A 82	Q82	-.57	-.61	1.24	1.22	a 99	Q99
1	.61	.03	.85	.80	B 83	Q83	-.54	-.77	1.05	1.07	b 93	Q93
1	.60	.17	.80	.71	C 84	Q84	-.48	-.09	1.25	1.30	c 100	Q100
1	.48	.56	.99	.90	D 90	Q90	-.33	-.17	.73	.70	d 101	Q101
1	.46	.01	.86	.79	E 89	Q89	-.32	-.67	.74	.79	e 91	Q91
1	.46	.30	.83	.78	F 81	Q81	-.31	-.16	.87	.87	f 97	Q97
1	.26	.82	1.44	1.27	G 94	Q94	-.23	-.80	1.80	1.97	g 95	Q95
1	.24	-.13	.72	.91	H 85	Q85	-.12	.48	.72	.70	h 96	Q96
1	.18	.37	1.15	1.11	I 80	Q80	-.07	-.16	.99	1.09	i 86	Q86
1	.04	.27	.90	.97	J 98	Q98	-.07	.04	1.07	1.09	j 87	Q87
1	.03	.18	1.14	1.03	K 88	Q88	-.06	-.08	1.30	1.57	k 79	Q79
1	.01	.02	.96	.96	L 78	Q78	-.04	.19	.79	.82	l 92	Q92

Figure 2. Standardized residual loadings for items in the first contrast of initial Social Interaction dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
       STANDARDIZED RESIDUAL CONTRAST 1 PLOT

      -1                                0                                1
      -+--------------------------------+--------------------------------+- COUNT
      |                                 |                                 |
   .6 +                                 |B   CA                           + 3
      |                                 |                                 |
   .5 +                                 |                  D              + 1
C     |                                 E         F                       | 2
O  .4 +                                 |                                 +
N     |                                 |                                 |
T  .3 +                                 |                                 +
R     |                             H   |                          G      | 2
A  .2 +                                 |           I                     + 1
S     |                                 |                                 |
T  .1 +                                 |                                 +
      |                                 |     K  J                        | 2
1  .0 +---------------------------------|L--------------------------------+ 1
      |                            i k  |j    l                           | 4
L -.1 +                                 |               h                 + 1
O     |                                 |                                 |
A -.2 +                                 |                                 +
D     |       g                         |                                 | 1
I -.3 +           e                f    |                                 + 2
N     |                           d     |                                 | 1
G -.4 +                                 |                                 +
      |                                 |                                 |
  -.5 +                              c  |                                 + 1
      |        b    a                   |                                 | 2
  -.6 +                                 |                                 +
      -+--------------------------------+--------------------------------+-
      -1                                0                                1
                                  ITEM MEASURE
 COUNT:       11  1 1             1212  13   13  11 1   1  1       1
```

Figure 3. The principal component analysis plot of item loading for the first contrast of the initial Social Interaction dimension

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
81	491	251	.14	.13	1.11	1.0	1.15	1.4	A .86	.86	61.3	64.7	Q81
90	437	234	.67	.14	1.13	1.1	1.12	1.0	B .83	.84	65.6	66.3	Q90
89	527	247	-.37	.12	1.07	.7	.99	-.1	C .86	.87	67.7	63.4	Q89
82	515	256	-.03	.13	.96	-.4	.93	-.6	c .87	.87	72.0	63.5	Q82
83	525	251	-.32	.13	.91	-.8	.91	-.8	b .88	.87	68.9	63.2	Q83
84	513	252	-.08	.13	.79	-2.1	.77	-2.4	a .88	.86	68.0	63.6	Q84
MEAN	501.3	248.5	.00	.13	.99	-.1	.98	-.2			67.2	64.1	
S.D.	31.1	7.0	.35	.00	.12	1.2	.13	1.2			3.3	1.1	

Figure 4. Item statistics, in misfit order, of 6-item group 1 comprising items Q81 to Q84, and items Q89 to Q90

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                  -- Empirical --    Modeled
Total raw variance in observations     =          19.3 100.0%         100.0%
  Raw variance explained by measures   =          13.3  69.0%          68.7%
    Raw variance explained by persons  =          12.7  65.8%          65.6%
    Raw Variance explained by items    =            .6   3.1%           3.1%
  Raw unexplained variance (total)     =           6.0  31.0% 100.0%   31.3%
    Unexplned variance in 1st contrast =           2.0  10.3%  33.1%
    Unexplned variance in 2nd contrast =           1.3   6.6%  21.3%
    Unexplned variance in 3rd contrast =           1.0   5.4%  17.4%
    Unexplned variance in 4th contrast =            .9   4.8%  15.3%
    Unexplned variance in 5th contrast =            .8   4.0%  12.8%
```

Figure 5. Standardized residual variance of the 6-item group 1 comprising items Q81 to Q84, and items Q89 to Q90

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
---------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     562  38| -4.43 -4.48|  1.19  1.05||  NONE   |( -5.38)| 1
|  2   2     558  37| -2.54 -2.47|   .89   .92||  -4.26  |  -2.33 | 2
|  3   3     220  15|  -.02  -.18|   .75   .71||   -.36  |    .58 | 3
|  4   4      85   6|  1.52  1.53|  1.13  1.40||   1.67  |   2.37 | 4
|  5   5      66   4|  2.95  3.05|  1.18  1.22||   2.96  |(  4.22)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      62   4| -2.27      |            ||         |        |
---------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 6. Category structure of the 6-item group 1 comprising items Q81 to Q84, and items Q89 to Q90

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                          555|
B      |                                                       555   |
A      |1                                                    55      |
B   .8 + 11               22                                5        +
I      |   1           222  222                            5         |
L      |    1        22        2                          5          |
I      |     11     2           2                        5           |
T   .6 +       1   2             22                     5            +
Y      |        1 2                2   33333           5             |
    .5 +         *                 2 33     33   44   5              +
O      |        2 1                 *         344  44*               |
F   .4 +       2   1               3 2        43    5 4              +
       |      2     1            33   2     4  3  5   44             |
R      |    22       1          3      2   44    35      4           |
E      |   2          1        3        2 4      53       4          |
S   .2 + 22            11    33          *2     55 3       44        +
P      |2                1  3          44  2   5    3         44     |
O      |                3**1         44     2*5      33         444  |
N      |           33333    1111 444     555 222      333         444|
S   .0 +**********************************1111111********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 7. Category probability curves of the 6-item group 1 comprising items Q81 to Q84, and items Q89 to Q90

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	.14	.15	M	.17	.27	-.03	.31	-.10	99	.9196	.8718	.10	81	Q81
F	-.18	.14	M	.46	.27	-.64	.30	-2.13	104	.0356	.0309	-.58	82	Q82
F	-.19	.14	M	-.76	.26	.57	.30	1.94	97	.0548	.0123	.96	83	Q83
F	-.08	.14	M	-.13	.26	.06	.30	.19	98	.8524	.4427	-.77	84	Q84
F	-.34	.14	M	-.46	.26	.11	.30	.39	98	.6988	.6296	-1.79	89	Q89
F	.65	.16	M	.75	.28	-.10	.32	-.32	94	.7513	.3982	-.51	90	Q90

Figure 8. Gender DIF of the 6-item group 1 comprising items Q81 to Q84, and items Q89 to Q90

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	.10	.15	M	.27	.27	-.18	.31	-.57	97	.5704	.6462	-.23	81	Q81
F	-.24	.15	M	-.69	.26	.46	.30	1.52	95	.1312	.0663	.82	83	Q83
F	-.08	.15	M	-.05	.27	-.04	.31	-.13	96	.9001	.6212	-.23	84	Q84
F	-.40	.14	M	-.37	.26	-.03	.30	-.11	96	.9148	.3520	-.63	89	Q89
F	.64	.16	M	.88	.29	-.24	.33	-.72	92	.4759	.4797	-.94	90	Q90

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 9. Gender DIF of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82

ITEM STATISTICS: MISFIT ORDER

ENTRY	TOTAL	TOTAL		MODEL	INFIT		OUTFIT		PT-MEASURE		EXACT MATCH		
NUMBER	SCORE	COUNT	MEASURE	S.E.	MNSQ	ZSTD	MNSQ	ZSTD	CORR.	EXP.	OBS%	EXP%	ITEM
81	491	251	.14	.13	1.30	2.6	1.33	2.8	A .84	.87	59.4	64.8	Q81
90	437	234	.69	.14	1.07	.7	1.02	.2	B .84	.85	69.0	67.3	Q90
89	527	247	-.40	.13	1.01	.1	.93	-.6	C .87	.87	72.9	63.2	Q89
83	525	251	-.34	.13	.88	-1.1	.87	-1.2	b .89	.88	68.0	62.9	Q83
84	513	252	-.08	.13	.73	-2.7	.70	-3.1	a .90	.87	73.7	64.5	Q84
MEAN	498.6	247.0	.00	.13	1.00	-.1	.97	-.4			68.6	64.5	
S.D.	33.4	6.7	.40	.00	.19	1.8	.21	1.9			5.1	1.6	

Figure 10. Item statistics, in misfit order, of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

    81  Q81                        .14     1.3   A    1.3
  RESPONSE:    1:   M   2   3   4   1    1   1   2   2   3
Z-RESIDUAL:                              X

  RESPONSE:   11:   M   3   5   1   M    1   1   M   3   2
Z-RESIDUAL:                     X        X   X

  RESPONSE:   21:   2   1   1   M   2    3   2   1   2   1
Z-RESIDUAL:             X                        X       X

  RESPONSE:   31:   3   1   3   2   2    1   1   3   3   4
Z-RESIDUAL:                              X

  RESPONSE:   41:   2   2   2   M   M    5   3   2   M   2
Z-RESIDUAL:

  RESPONSE:   51:   2   1   2   2   1    1   3   2   1   2
Z-RESIDUAL:         2               X    X           X

  RESPONSE:   61:   1   1   5   2   4    5   1   1   3   2
Z-RESIDUAL:         X   X   X

  RESPONSE:   71:   1   M   1   3   M    2   4   2   2   1
Z-RESIDUAL:        -2       X

  RESPONSE:   81:   4   1   M   1   1    2   1   3   1   4
Z-RESIDUAL:             X       X            X

  RESPONSE:   91:   2   2   3   1   1    3   5   3   1   1
Z-RESIDUAL:                 3       X        X           X
```


The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
  RESPONSE:    101:   4   2   2   3   2    1   1   1   2   3
Z-RESIDUAL:           4                    X       X   2

  RESPONSE:    111:   1   4   2   2   1    2   M   3   3   1
Z-RESIDUAL:                           X

  RESPONSE:    121:   M   2   1   2   M    2   1   M   2   1
Z-RESIDUAL:                                                X

  RESPONSE:    131:   1   1   1   1   2    1   1   2   3   2
Z-RESIDUAL:           X   X               -2   X

  RESPONSE:    141:   1   1   1   1   4    1   1   2   1   1
Z-RESIDUAL:           X   X   X                X           X

  RESPONSE:    151:   1   2   1   2   2    3   1   3   2   2
Z-RESIDUAL:           X      -2

  RESPONSE:    161:   2   2   2   2   4    3   2   2   2   1
Z-RESIDUAL:

  RESPONSE:    171:   1   4   3   1   2    2   3   1   1   1
Z-RESIDUAL:                       X                    X   X

  RESPONSE:    181:   2   1   M   1   2    1   1   1   2   2
Z-RESIDUAL:                       X        X

  RESPONSE:    191:   1   1   1   1   1    1   1   5   1   M
Z-RESIDUAL:           X           X  -2        X   X
  RESPONSE:    201:   2   1   1   2   1    2   1   3   2   M
Z-RESIDUAL:                   X       X

  RESPONSE:    211:   2   3   1   3   4    4   2   1   1   1
Z-RESIDUAL:                   X            3   2   X   X  -2

  RESPONSE:    221:   1   3   1   3   4    1   3   1   3   1
Z-RESIDUAL:                   X       3   -2               X

  RESPONSE:    231:   2   2   M   2   5    1   1   1   2   1
Z-RESIDUAL:                                X   X           X

  RESPONSE:    241:   1   3   2   2   3    2   3   M   2   2
Z-RESIDUAL:           X                                    2

  RESPONSE:    251:   3   2   4   1   2    1   2   2   M   M
Z-RESIDUAL:                       X

  RESPONSE:    261:   1   1   2   2   1    1   1   3   2   2
Z-RESIDUAL:                                X   X

  RESPONSE:    271:   1   5   2   M
Z-RESIDUAL:           X   X
```

Figure 11. Persons' responses to item Q81 in the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
81	476	247	.29	.14	1.14	1.3	1.12	1.0	A .86	.87	59.6	66.8	Q81
90	437	234	.70	.14	1.09	.9	1.03	.3	B .85	.86	69.4	68.3	Q90
89	527	247	-.46	.13	1.04	.4	.94	-.5	C .88	.88	68.2	64.6	Q89
83	525	251	-.40	.13	.94	-.5	.93	-.6	b .89	.89	67.4	64.2	Q83
84	513	252	-.13	.13	.78	-2.2	.74	-2.6	a .90	.88	74.1	65.7	Q84
MEAN	495.6	246.2	.00	.14	1.00	.0	.95	-.5			67.7	65.9	
S.D.	34.6	6.4	.44	.00	.13	1.2	.13	1.2			4.7	1.5	

Figure 10. Item statistics, in misfit order, of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	17.6	100.0%		100.0%
Raw variance explained by measures	=	12.6	71.6%		71.5%
Raw variance explained by persons	=	12.2	69.6%		69.4%
Raw Variance explained by items	=	.4	2.0%		2.0%
Raw unexplained variance (total)	=	5.0	28.4%	100.0%	28.5%
Unexplned variance in 1st contrast	=	1.6	9.0%	31.7%	
Unexplned variance in 2nd contrast	=	1.3	7.6%	26.9%	
Unexplned variance in 3rd contrast	=	1.1	6.1%	21.6%	
Unexplned variance in 4th contrast	=	1.0	5.6%	19.6%	
Unexplned variance in 5th contrast	=	.0	.0%	.1%	

Figure 11. Standardized residual variance of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
81	476	247	.29	.14	1.14	1.3	1.12	1.0	A .86	.88	59.6	66.8	Q81
90	437	234	.70	.14	1.09	.9	1.03	.3	B .87	.87	69.4	68.3	Q90
89	527	247	-.46	.13	1.04	.4	.94	-.5	C .86	.87	68.2	64.6	Q89
83	525	251	-.40	.13	.94	-.5	.93	-.6	b .88	.88	67.4	64.2	Q83
84	513	252	-.13	.13	.78	-2.2	.74	-2.6	a .90	.87	74.1	65.7	Q84
MEAN	495.6	246.2	.00	.14	1.00	.0	.95	-.5			67.7	65.9	
S.D.	34.6	6.4	.44	.00	.13	1.2	.13	1.2			4.7	1.5	

Figure 12. Item statistics, in misfit order, of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, and showing point-biserial correlations, after removing item Q82, and editing 4 persons' responses to item Q81

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	465	38	-4.99	-5.06	1.17	1.02	NONE	(-5.88)	1
2	2	466	38	-2.77	-2.70	.97	.97	-4.77	-2.55	2
3	3	177	14	.10	-.02	.74	.67	-.31	.73	3
4	4	65	5	1.89	1.82	1.00	1.14	1.94	2.59	4
5	5	58	5	3.34	3.44	1.23	1.28	3.15	(4.42)	5
MISSING		53	4	-2.64						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 13. Category structure of the of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                           55|
B      |                                                        555  |
A      |                                                      55     |
B   .8 +              22222222                               5       +
I      |11          22        2                             5        |
L      |  1        2           22                         55         |
I      |   1     22              2                       5           |
T   .6 +    1   2                 2     3333             5           +
Y      |     1 2                   2  33    33          5            |
    .5 +      *                     23        3        5             +
O      |     2 1                    32         3444444*              |
F   .4 +    2   1                  3  2        43    5 4             +
       |   2     1                3   2      4  3  5   4             |
R      |  2       1             33     2    4    35     44          |
E      |22         11          3        2 44      *      4         |
S   .2 +             1      33          *      55 3       44       +
P      |              11    3            4 2    5    3        44     |
O      |                1**3          444   2255      33        444  |
N      |            33333  1111    444     5552222      3333       44|
S   .0 +***********************************1111111*******************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 14. Category probability curves of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	.24	.16	M	.44	.29	-.19	.33	-.60	95	.5526	.5996	-.26	81	Q81
F	-.29	.15	M	-.77	.27	.48	.31	1.56	95	.1230	.0602	.82	83	Q83
F	-.13	.15	M	-.09	.28	-.04	.31	-.13	97	.8993	.7369	-.56	84	Q84
F	-.46	.15	M	-.42	.27	-.04	.31	-.13	97	.9000	.3650	-.68	89	Q89
F	.64	.16	M	.88	.30	-.24	.34	-.70	92	.4828	.5074	-.90	90	Q90

Figure 15. Gender DIF of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 203 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	10.5	4.7	-2.20	.92	.93	-.2	.93	-.2
S.D.	4.4	.8	2.69	.21	.96	1.3	.98	1.3
MAX.	24.0	5.0	4.75	1.66	6.00	5.7	6.04	5.8
MIN.	3.0	1.0	-6.22	.60	.00	-2.8	.00	-2.8

```
 REAL RMSE   1.05 TRUE SD    2.48  SEPARATION  2.37  PERSON RELIABILITY  .85
MODEL RMSE    .95 TRUE SD    2.52  SEPARATION  2.66  PERSON RELIABILITY  .88
 S.E. OF PERSON MEAN = .19

 MAXIMUM EXTREME SCORE:      4 PERSON
 MINIMUM EXTREME SCORE:     59 PERSON
     LACKING RESPONSES:      8 PERSON
```

SUMMARY OF 5 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	495.6	246.2	.00	.14	1.00	.0	.95	-.5
S.D.	34.6	6.4	.44	.00	.13	1.2	.13	1.2
MAX.	527.0	252.0	.70	.14	1.14	1.3	1.12	1.0
MIN.	437.0	234.0	-.46	.13	.78	-2.2	.74	-2.6

```
 REAL RMSE    .14 TRUE SD     .42  SEPARATION  2.99  ITEM    RELIABILITY  .90
MODEL RMSE    .14 TRUE SD     .42  SEPARATION  3.08  ITEM    RELIABILITY  .90
 S.E. OF ITEM MEAN = .22
```

DELETED: 1 ITEM

Figure 16. Separations and reliabilities of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons’ responses to item Q81

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
                PERSON - MAP - ITEM
                    <more>|<rare>
    5                  .  +
                       .  |
                          |
                          |
                          |
    4                     +
                          |
                          |
                       .  |
                         T|
    3                  .  +
                          |
                       .  |
                          |
                          |
    2                     +
                       .  |
                      .#  |
                       .  |
                       .  |
    1                     +
                      .#  |T
                          |  Q90
                         S|S
                      .#  |  Q81
    0                  .  +M
                     .##  |  Q84
                       .  |S Q83     Q89
                       .  |
                     ###  |T
   -1                     +
                          |
                          |
                     .##  |
                          |
   -2                     +
                       . M|
                          |
                  ######  |
                       #  |
   -3                     +
                          |
                          |
                    .###  |
                       .  |
   -4                  .  +
                       .  |
                    ####  |
                       .  |
                       . S|
   -5                  .  +
                    .###  |
                          |
                       .  |
                          |
   -6                  .  +
                    .###  |
                          |
                          |
                          |
   -7         .###########  +
                    <less>|<frequ>
 EACH "#" IS 5. EACH "." IS 1 TO 4
```

Figure 17. Person-item map of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    5              . +
                   . |
                     |
                     |                             Q90 .45
                     |
    4                +
                     |                             Q81 .45
                     |
                   . |                             Q84 .45
                    T|                             Q83 .45
                                                   Q89 .45
    3              . +
                     |
                   . |
                     |                    Q90 .35
                     |
    2                +                    Q81 .35
                   . |
                  .# |                    Q84 .35
                   . |                    Q83 .35
                   . |                    Q89 .35
    1                +
                  .# |T
                     |
                    S|S
                  .# |           Q90 .25
    0              . +M
                 .## |           Q81 .25
                   . |S
                   . |           Q84 .25
                 ### |T
   -1                +           Q83 .25
                                 Q89 .25
                     |
                     |
                 .## |
                     |
   -2                +
                   .M|
                     |
              ###### |
                   # |
   -3                +
                     |
                     |
                .### |
                   . |
   -4              . +
                   . |  Q90 .15
                #### |
                   . |  Q81 .15
                   .S|
   -5              . +  Q84 .15
                .### |  Q83 .15
                        Q89 .15
                     |
                   . |
                     |
   -6              . +
                .### |
                     |
                     |
                     |
   -7   .########### +
               <less>|
 EACH "#" IS 5. EACH "." IS 1 TO 4
```

Figure 18. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
83	89	-0.3921
81	84	-0.3742
81	90	-0.3511
83	90	-0.3399
81	89	-0.2465
84	89	-0.2254
83	84	-0.2013
89	90	-0.1782
81	83	-0.103
84	90	-0.0687

Figure 19. Correlations of residuals for each item pair of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-7      -5      -3      -1       1       3       5       7
|-------+-------+-------+-------+-------+-------+-------|  NUM   ITEM
1      1    :        2       :    3   :  4   :  5       5   90  Q90
|                                                       |
1     1   :        2       :    3   :   4   :  5        5   81  Q81
|                                                       |
1   1   :        2       :    3   :   4   :  5          5   84  Q84
|                                                       |
1  1   :        2       :    3   :   4   :  5           5   83  Q83
1  1   :        2       :    3   :   4   :  5           5   89  Q89
|-------+-------+-------+-------+-------+-------+-------|  NUM   ITEM
-7      -5      -3      -1       1       3       5       7

4  1   1  2   1   2   1  1 1
9 7831172201126 1591  2  52219 7 47 4 4 2 4    3  1 3      PERSON
  S            M             S            T
0 20  30 40  50  60  70   80     90               99       PERCENTILE
```

Figure 20. Construct keymap of the 5-item group 1 comprising items Q81, Q83, Q84, Q89, Q90, after removing item Q82, and editing 4 persons' responses to item Q81

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	1009	36	-2.82	-2.82	1.09	1.05	NONE	(-3.62)	1
2	2	1079	38	-1.46	-1.43	.88	.93	-2.45	-1.37	2
3	3	472	17	-.38	-.47	.85	.84	-.10	.28	3
4	4	164	6	.32	.30	.99	1.07	.98	1.46	4
5	5	86	3	.74	.96	1.27	1.53	1.57	(2.96)	5
MISSING		163	5	-1.86						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 21. Category structure of the initial 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                         |
A      |                                                         |
B   .8 +111                                                     5+
I      |   11                                                 55 |
L      |     11                                              5   |
I      |       1                                           55    |
T   .6 +        11        2222222                         5      +
Y      |          1     222       222                    5       |
    .5 +           1122              2                 55        +
O      |           221                22              5          |
F   .4 +         22    11              3*3333333    445          +
       |       22        1           33   22      **44 54444     |
R      |     22           11       33      2  44  335      444   |
E      |   22               11   33         **    553         444|
S   .2 + 22                   1*3          44  2  5   33        44+
P      |2                   333 11       44      **     33       |
O      |                 333      111444      55  22      333    |
N      |           333333      444441111**55      22222     33333|
S   .0 +***********************555555555  1111111111111**********+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -4      -3      -2      -1       0       1       2       3
        PERSON [MINUS] ITEM MEASURE
```

Figure 22. Category probability curves of the initial 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                       |
B      |                                                      5|
A      |                                                   555 |
B   .8 +1                                                 5    +
I      | 11                                             55     |
L      |   1                      3333333              5       |
I      |    1                   33        33         55        |
T   .6 +     1      2222222   33            33      5          +
Y      |      11   22       22   3            3   5            |
    .5 +        12            223              3*              +
O      |       221            32               5 3             |
F   .4 +      2   1          3  2            55   3            +
       |    22     1       33     22        5      3           |
R      |   2        1     3         2      5        33         |
E      | 22          11  3           2    55          33       |
S   .2 +2               *3            22   5            3      +
P      |             33 11              2*5               333  |
O      |           33     111         555 222                 3|
N      |      33333          111*5555       22222              |
S   .0 +******555555555555555555 1111111111111111**************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
        -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 23. Category probability curves of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |1                                                        |
A      | 1111                                                    |
B   .8 +     11                                                44+
I      |       11                                            44 |
L      |         11                                        44   |
I      |           11                                    44     |
T   .6 +             1        22222222                  4        +
Y      |              11   222        222              4         |
    .5 +                122              2           44          +
O      |               2211               22  33333 4            |
F   .4 +             22    1               3*3     *33           +
       |           22       11           33  22   4   333        |
R      |         22           1         33      244       33      |
E      |       22              11     33        422         333   |
S   .2 +     22                  1*33        44   2           33 +
P      |  222                   33 111     44      222          3|
O      |22                  3333      11*44           22         |
N      |              333333       44444 11111          222222   |
S   .0 +**************4444444444444           1111111111111111***+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -4      -3      -2      -1       0       1       2       3
        PERSON [MINUS] ITEM MEASURE
```

Figure 24. Category probability curves of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 4 and 5

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                       |
B      |                                                     55|
A      |11                    222222                       55  |
B   .8 +  11               222      222                  55    +
I      |    1            22            2                5      |
L      |     11         2               22             5       |
I      |       1      22                  2           5        |
T   .6 +        1    2                     2         5         +
Y      |         1  2                       2       5          |
    .5 +          **                         2     5           +
O      |         2  1                         2   5            |
F   .4 +        2    1                        2  5             +
       |       2      1                       4**4             |
R      |     22        11                  444 52 444          |
E      |    2            1               44   5  2   44        |
S   .2 +  22              11           44    5    2    44      +
P      |22                  11       44     5      22    444   |
O      |                      1111444     55         22     444|
N      |                   44444441111*555             2222    |
S   .0 +*******************55555555555 11111111111111111111****+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4
        PERSON [MINUS] ITEM MEASURE
```

Figure 25. Category probability curves of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 2 and 3

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1    1009  36| -3.06 -3.06|  1.04  1.06||  NONE   |( -3.81)| 1
|  2   2    1079  38| -1.55 -1.53|   .89   .91||  -2.64  |  -1.48 | 2
|  3   3     636  23|  -.05  -.10|   .95   .96||   -.30  |   1.34 | 3
|  5   4      86   3|  1.15  1.40|  1.28  1.25||   2.94  |(  4.07)| 5
|-------------------+------------+------------++---------+--------|
|MISSING     163   5| -1.99      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 26. Category structure of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4

```
        ITEM STATISTICS:  MISFIT ORDER

--------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|      |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM |
|------------------------------------+----------+----------+-----------+-----------+------|
|    79    557    271    -.41    .11|1.30   3.2|1.35   3.5|A .67   .76| 56.0  60.8| Q79  |
|    94    455    264     .82    .12|1.26   2.7|1.24   2.0|B .67   .70| 63.6  64.2| Q94  |
|    80    464    249     .27    .12|1.17   1.8|1.22   2.0|C .69   .73| 58.0  62.0| Q80  |
|    78    546    272    -.25    .11|1.03    .3|1.01    .2|D .72   .75| 61.5  60.8| Q78  |
|    88    476    241     .09    .12| .99   -.1| .97   -.3|E .76   .73| 63.5  61.2| Q88  |
|    98    470    242     .12    .12| .94   -.6| .98   -.2|F .75   .73| 63.9  61.4| Q98  |
|    92    473    241     .00    .12| .90  -1.1| .92   -.8|e .76   .74| 66.4  61.3| Q92  |
|    87    528    265    -.14    .11| .89  -1.3| .86  -1.6|d .79   .74| 71.8  61.2| Q87  |
|    86    544    262    -.43    .11| .88  -1.4| .86  -1.5|c .78   .76| 68.9  60.8| Q86  |
|    85    536    255    -.41    .11| .81  -2.3| .83  -1.9|b .79   .76| 68.0  60.9| Q85  |
|    96    456    248     .35    .12| .78  -2.6| .78  -2.2|a .76   .72| 69.1  61.7| Q96  |
|------------------------------------+----------+----------+-----------+-----------+------|
| MEAN  500.5  255.5     .00    .12| .99   -.1|1.00   -.1|           | 64.6  61.5|      |
| S.D.   39.1   11.4     .37    .00| .17   1.8| .18   1.8|           |  4.6    .9|      |
--------------------------------------------------------------------------------
```

Figure 27. Item statistics, in misfit order, of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

    79  Q79                     -.41     1.3   A    1.3
  RESPONSE:     1:  1   3   3   3   3    1   1   2   2   3
Z-RESIDUAL:                         3    X

  RESPONSE:    11:  3   3   5   1   2    1   1   3   3   2
Z-RESIDUAL:                     X        X       2

  RESPONSE:    21:  2   1   2   3   2    1   2   1   2   1
Z-RESIDUAL:             X                                X

  RESPONSE:    31:  3   2   3   3   2    2   3   1   3   1
Z-RESIDUAL:                                             -2

  RESPONSE:    41:  2   2   1   M   2    3   2   3   2   2
Z-RESIDUAL:

  RESPONSE:    51:  2   2   2   3   1    1   2   2   1   1
Z-RESIDUAL:                     2   X    X           X

  RESPONSE:    61:  1   1   3   2   3    5   3   2   2   2
Z-RESIDUAL:         X                    X

  RESPONSE:    71:  3   3   1   2   1    1   3   3   3   3
Z-RESIDUAL:                             -2

  RESPONSE:    81:  1   1   2   2   2    2   1   3   2   3
Z-RESIDUAL:        -3           2

  RESPONSE:    91:  2   1   2   1   1    3   5   3   1   1
Z-RESIDUAL:                         X        X
```


The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
  RESPONSE:    101:  3   2   3   2   2    3   1   1   2   2
Z-RESIDUAL:

  RESPONSE:    111:  3   3   3   2   1    1   2   3   2   1
Z-RESIDUAL:

  RESPONSE:    121:  2   3   3   M   2    2   1   1   2   2
Z-RESIDUAL:                  2

  RESPONSE:    131:  1   1   2   1   2    1   1   2   3   2
Z-RESIDUAL:          X   X       X       -3   X

  RESPONSE:    141:  1   2   1   1   3    2   2   2   2   2
Z-RESIDUAL:                  X

  RESPONSE:    151:  1   2   2   2   1    3   3   2   3   3
Z-RESIDUAL:          X              -2

  RESPONSE:    161:  2   2   3   3   3    3   2   2   3   2
Z-RESIDUAL:

  RESPONSE:    171:  2   3   3   3   3    3   3   2   1   1
Z-RESIDUAL:                      2                    X   X

  RESPONSE:    181:  2   3   1   2   1    1   1   1   2   2
Z-RESIDUAL:                      2

  RESPONSE:    191:  3   2   2   1   1    1   1   1   2   2
Z-RESIDUAL:          2                        X  -5
  RESPONSE:    201:  2   1   3   3   1    2   1   3   3   5
Z-RESIDUAL:              X           X                    2

  RESPONSE:    211:  2   3   1   2   3    1   2   2   1   1
Z-RESIDUAL:                     -2       -2              -3

  RESPONSE:    221:  1   3   1   3   3    2   3   2   2   1
Z-RESIDUAL:

  RESPONSE:    231:  2   3   3   2   2    1   1   3   3   2
Z-RESIDUAL:                               X   X

  RESPONSE:    241:  1   3   1   3   2    1   2   3   2   2
Z-RESIDUAL:                              -2

  RESPONSE:    251:  2   2   3   1   2    2   2   3   3   M
Z-RESIDUAL:                      X

  RESPONSE:    261:  2   1   2   2   1    1   1   2   2   3
Z-RESIDUAL:                                   X

  RESPONSE:    271:  1   5   3   1
Z-RESIDUAL:          X
```

Figure 28. Persons' responses to item Q79 in the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
94	455	264	.85	.12	1.29	3.0	1.28	2.2	A .67	.71	64.0	64.8	Q94
80	464	249	.28	.12	1.20	2.1	1.25	2.2	B .70	.74	58.5	62.8	Q80
79	550	266	-.50	.11	1.09	1.0	1.08	.9	C .72	.76	58.0	61.0	Q79
78	546	272	-.25	.11	1.06	.7	1.05	.6	D .72	.76	61.9	61.5	Q78
88	476	241	.10	.12	1.02	.2	1.00	.0	E .76	.74	64.4	62.0	Q88
98	470	242	.13	.12	.96	-.4	.99	.0	F .75	.74	65.3	62.5	Q98
92	473	241	.01	.12	.92	-.9	.94	-.6	e .76	.75	66.4	62.1	Q92
87	528	265	-.14	.11	.91	-1.0	.87	-1.4	d .79	.75	71.8	62.0	Q87
86	544	262	-.43	.11	.89	-1.2	.87	-1.4	c .79	.76	68.9	61.5	Q86
85	536	255	-.42	.12	.83	-2.0	.86	-1.5	b .79	.76	68.0	61.6	Q85
96	456	248	.36	.12	.79	-2.4	.79	-2.1	a .77	.73	69.5	62.5	Q96
MEAN	499.8	255.0	.00	.12	1.00	-.1	1.00	-.1			65.2	62.2	
S.D.	38.2	10.8	.39	.00	.15	1.6	.15	1.4			4.2	.9	

Figure 29. Item statistics, in misfit order, of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4, and adjusting 5 persons'

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

responses to item Q79.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     94  Q94                         .85     1.3   A    1.3
  RESPONSE:       1:  1   2   3   2   1    1   2   1   2   3
Z-RESIDUAL:                                X

  RESPONSE:      11:  3   2   5   1   1    1   1   M   3   1
Z-RESIDUAL:                       X        X

  RESPONSE:      21:  2   M   2   2   1    5   1   1   1   1
Z-RESIDUAL:                                5               X

  RESPONSE:      31:  3   1   3   1   2    1   2   1   5   1
Z-RESIDUAL:                                            2

  RESPONSE:      41:  2   2   1   1   M    2   2   3   2   1
Z-RESIDUAL:

  RESPONSE:      51:  1   1   2   1   1    1   1   2   1   2
Z-RESIDUAL:                           X    X           X

  RESPONSE:      61:  1   1   M   1   2    5   2   1   2   2
Z-RESIDUAL:           X                    X

  RESPONSE:      71:  1   1   1   2   2    2   3   2   1   2
Z-RESIDUAL:

  RESPONSE:      81:  1   1   1   1   1    3   1   3   1   3
Z-RESIDUAL:          -3

  RESPONSE:      91:  1   1   1   1   1    1   5   2   2   1
Z-RESIDUAL:                           X        X
  RESPONSE:     101:  2   1   2   3   1    5   1   2   2   3
Z-RESIDUAL:                                3       2

  RESPONSE:     111:  1   3   1   2   1    1   2   1   1   1
Z-RESIDUAL:

  RESPONSE:     121:  2   1   1   1   1    1   1   1   3   1
Z-RESIDUAL:

  RESPONSE:     131:  M   1   2   1   3    2   1   2   2   2
Z-RESIDUAL:               X       X            X

  RESPONSE:     141:  1   1   1   2   2    1   1   2   2   1
Z-RESIDUAL:                   X

  RESPONSE:     151:  1   2   2   2   1    3   2   2   2   2
Z-RESIDUAL:           X

  RESPONSE:     161:  1   2   1   2   5    5   2   2   2   1
Z-RESIDUAL:                           2    2

  RESPONSE:     171:  1   3   2   1   M    2   2   1   1   1
Z-RESIDUAL:                                            X   X

  RESPONSE:     181:  2   1   1   1   1    1   1   2   2   1
Z-RESIDUAL:

  RESPONSE:     191:  1   1   2   1   3    2   1   5   2   1
Z-RESIDUAL:                           3        X
```


The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
  RESPONSE:    201:  2    1    1    1    1     2    3    2    2    1
Z-RESIDUAL:               X              X          2             -2

  RESPONSE:    211:  1    2    1    3    2     1    1    1    2    3
Z-RESIDUAL:                                                   3

  RESPONSE:    221:  1    2    1    3    1     2    3    1    1    2
Z-RESIDUAL:                                                  -2    3

  RESPONSE:    231:  3    2    1    2    2     1    1    3    1    2
Z-RESIDUAL:                                    X    X

  RESPONSE:    241:  2    3    1    1    1     2    1    2    2    1
Z-RESIDUAL:          3                  -2

  RESPONSE:    251:  2    2    2    1    2     1    2    2    M    M
Z-RESIDUAL:                         X

  RESPONSE:    261:  1    1    1    3    1     1    M    2    1    3
Z-RESIDUAL:

  RESPONSE:    271:  1    5    3    M
Z-RESIDUAL:          X
```

Figure 30. Persons' responses to item Q94 in the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4 and adjusting 5 persons' responses to item Q79.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
80	464	249	.28	.12	1.22	2.2	1.26	2.3	A .70	.74	59.4	63.4	Q80
79	550	266	-.53	.11	1.12	1.3	1.10	1.1	B .73	.76	58.4	61.4	Q79
78	546	272	-.27	.11	1.10	1.1	1.10	1.1	C .72	.76	61.9	62.1	Q78
94	437	258	.97	.12	1.06	.6	.99	-.1	D .72	.71	65.7	65.8	Q94
88	476	241	.09	.12	1.04	.5	1.03	.3	E .76	.75	64.4	62.6	Q88
98	470	242	.13	.12	.98	-.2	1.04	.4	F .76	.75	65.3	63.2	Q98
92	473	241	.00	.12	.94	-.6	.98	-.1	e .76	.75	66.8	62.7	Q92
87	528	265	-.15	.12	.93	-.7	.89	-1.2	d .79	.76	72.3	62.5	Q87
86	544	262	-.45	.12	.91	-1.0	.88	-1.3	c .79	.77	68.9	62.0	Q86
85	536	255	-.44	.12	.84	-1.9	.87	-1.5	b .80	.77	68.4	62.2	Q85
96	456	248	.36	.12	.81	-2.2	.81	-1.9	a .77	.74	69.5	63.2	Q96
MEAN	498.2	254.5	.00	.12	1.00	-.1	.99	-.1			65.5	62.8	
S.D.	40.5	10.5	.42	.00	.12	1.3	.12	1.2			4.1	1.1	

Figure 31. Item statistics, in misfit order, of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4, and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

     80  Q80                         .28     1.2   A    1.3
  RESPONSE:    1:   M   3   2   3   1     1   2   2   2   3
Z-RESIDUAL:                               X

  RESPONSE:   11:   M   1   5   1   M     1   1   1   3   1
Z-RESIDUAL:                     X         X

  RESPONSE:   21:   2   1   1   1   3     1   2   1   2   1
Z-RESIDUAL:             X                                 X

  RESPONSE:   31:   1   2   M   1   1     M   1   2   2   3
Z-RESIDUAL:        -3

  RESPONSE:   41:   2   2   1   M   M     3   3   3   M   1
Z-RESIDUAL:

  RESPONSE:   51:   2   2   2   1   1     1   3   3   1   2
Z-RESIDUAL:                         X     X           X

  RESPONSE:   61:   1   1   M   2   2     5   2   1   3   2
Z-RESIDUAL:         X                     X

  RESPONSE:   71:   1   M   2   2   M     3   3   2   3   2
Z-RESIDUAL:

  RESPONSE:   81:   5   2   M   1   2     2   1   3   1   3
Z-RESIDUAL:

  RESPONSE:   91:   2   1   2   1   1     3   5   3   1   1
Z-RESIDUAL:                         X         X
  RESPONSE:  101:   5   1   2   1   2     1   1   1   2   2
Z-RESIDUAL:         2          -2

  RESPONSE:  111:   1   3   2   2   1     1   M   3   1   1
Z-RESIDUAL:

  RESPONSE:  121:   M   1   1   2   M     2   1   1   2   1
Z-RESIDUAL:

  RESPONSE:  131:   1   1   1   1   2     3   1   2   2   2
Z-RESIDUAL:         X   X       X             X

  RESPONSE:  141:   3   3   1   1   3     1   1   2   2   1
Z-RESIDUAL:         3   3   X

  RESPONSE:  151:   1   1   1   2   3     3   2   3   2   3
Z-RESIDUAL:         X      -2                     2

  RESPONSE:  161:   2   2   2   2   3     3   2   3   2   2
Z-RESIDUAL:

  RESPONSE:  171:   2   3   3   2   2     2   3   2   M   M
Z-RESIDUAL:

  RESPONSE:  181:   1   1   2   1   1     2   1   1   2   2
Z-RESIDUAL:                 3             2

  RESPONSE:  191:   2   1   2   1   1     2   1   5   2   M
Z-RESIDUAL:                                   X
  RESPONSE:  201:   2   1   1   3   1     2   1   3   2   M
Z-RESIDUAL:             X           X

  RESPONSE:  211:   1   2   2   2   3     2   1   1   1   1
Z-RESIDUAL:                 3  -2                        -3

  RESPONSE:  221:   1   3   1   1   2     2   3   1   1   1
Z-RESIDUAL:                    -2                    -2

  RESPONSE:  231:   2   2   M   2   3     1   1   1   3   1
Z-RESIDUAL:                               X   X  -2

  RESPONSE:  241:   1   3   M   2   3     3   M   M   2   1
Z-RESIDUAL:

  RESPONSE:  251:   3   2   3   1   2     2   2   2   2   M
Z-RESIDUAL:                     X

  RESPONSE:  261:   2   1   1   3   2     1   M   3   2   3
Z-RESIDUAL:

  RESPONSE:  271:   1   1   2   1
Z-RESIDUAL:         X  -4
```

Figure 32. Persons' responses to item Q80 in the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4, and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
78	546	272	-.27	.12	1.15	1.6	1.17	1.8	A .72	.77	62.0	62.5	Q78
79	550	266	-.54	.12	1.14	1.6	1.12	1.3	B .73	.77	58.5	61.7	Q79
94	437	258	.99	.13	1.07	.7	1.00	.1	C .72	.72	65.4	66.1	Q94
88	476	241	.10	.12	1.06	.7	1.07	.7	D .76	.76	64.7	63.1	Q88
98	470	242	.13	.12	1.00	.0	1.05	.5	E .76	.76	65.1	63.6	Q98
92	473	241	.00	.12	.96	-.4	1.00	.1	F .76	.76	66.7	63.2	Q92
80	451	242	.28	.12	1.00	.0	.95	-.5	e .75	.74	61.3	63.5	Q80
87	528	265	-.16	.12	.95	-.5	.91	-1.0	d .79	.77	72.0	62.9	Q87
86	544	262	-.46	.12	.93	-.7	.90	-1.0	c .79	.78	69.1	62.4	Q86
85	536	255	-.45	.12	.85	-1.7	.88	-1.3	b .80	.78	69.4	62.5	Q85
96	456	248	.37	.12	.83	-1.9	.83	-1.7	a .77	.75	68.9	63.7	Q96
MEAN	497.0	253.8	.00	.12	.99	-.1	.99	-.1			65.7	63.2	
S.D.	41.6	11.0	.43	.00	.10	1.1	.10	1.1			3.9	1.1	

Figure 33. Item statistics, in misfit order, of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

```
TABLE 11.1 04 Apr data.xls                          ZOU082WS.TXT  Jul 22 17:38 2018
INPUT: 274 PERSON  172 ITEM  REPORTED: 273 PERSON  11 ITEM  4 CATS WINSTEPS 3.71.0.1
-------------------------------------------------------------------------------------

NO POORLY FITTING ITEM
```

Figure 34. Table 11.1, generated from 11. ITEM: responses under Output Tables in WINSTEPS, depicting no poorly fitting item in the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	23.3	100.0%		100.0%
Raw variance explained by measures	=	12.3	52.8%		52.7%
Raw variance explained by persons	=	8.6	36.8%		36.7%
Raw Variance explained by items	=	3.7	16.0%		15.9%
Raw unexplained variance (total)	=	11.0	47.2%	100.0%	47.3%
Unexplned variance in 1st contrast	=	1.8	7.9%	16.8%	
Unexplned variance in 2nd contrast	=	1.6	7.0%	14.9%	
Unexplned variance in 3rd contrast	=	1.3	5.6%	11.9%	
Unexplned variance in 4th contrast	=	1.2	5.2%	10.9%	
Unexplned variance in 5th contrast	=	1.1	4.8%	10.1%	

Figure 35. Standardized residual variance of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons'

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
78	546	272	-.27	.12	1.15	1.6	1.17	1.8	A .65	.72	62.0	62.5	Q78
79	550	266	-.54	.12	1.14	1.6	1.12	1.3	B .66	.72	58.5	61.7	Q79
94	437	258	.99	.13	1.07	.7	1.00	.1	C .73	.70	65.4	66.1	Q94
88	476	241	.10	.12	1.06	.7	1.07	.7	D .73	.74	64.7	63.1	Q88
98	470	242	.13	.12	1.00	.0	1.05	.5	E .76	.76	65.1	63.6	Q98
92	473	241	.00	.12	.96	-.4	1.00	.1	F .77	.76	66.7	63.2	Q92
80	451	242	.28	.12	1.00	.0	.95	-.5	e .76	.75	61.3	63.5	Q80
87	528	265	-.16	.12	.95	-.5	.91	-1.0	d .78	.74	72.0	62.9	Q87
86	544	262	-.46	.12	.93	-.7	.90	-1.0	c .78	.75	69.1	62.4	Q86
85	536	255	-.45	.12	.85	-1.7	.88	-1.3	b .74	.74	69.4	62.5	Q85
96	456	248	.37	.12	.83	-1.9	.83	-1.7	a .76	.74	68.9	63.7	Q96
MEAN	497.0	253.8	.00	.12	.99	-.1	.99	-.1			65.7	63.2	
S.D.	41.6	11.0	.43	.00	.10	1.1	.10	1.1			3.9	1.1	

Figure 36. Item statistics, in misfit order, of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	1001	36	-3.37	-3.35	.98	.99	NONE	(-4.06)	1
2	2	1075	39	-1.69	-1.70	.93	.92	-2.90	-1.64	2
3	3	632	23	.00	-.05	.98	.99	-.37	1.46	3
5	4	84	3	1.70	2.07	1.36	1.27	3.27	(4.39)	5
MISSING		175	6	-2.00						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 37. Category structure of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                             +
O      |                                                             |
B      |1                                                            |
A      | 111                                                       55|
B   .8 +    11                                                    5  +
I      |      1                             3333333             55   |
L      |       1                          33       33          5     |
I      |        11         2222         33           33      55      |
T   .6 +          1     222    22      3               3    5        +
Y      |           1  22         22  33                 3  5         |
    .5 +            12             23                    3*          +
O      |            21             322                  55 3         |
F   .4 +          22  1           3   2                5    3        +
       |         2     11        3     2              5      3       |
R      |       22        1     33       22           5        33     |
E      |      2           1   3           2        55           33   |
S   .2 +    22             113             22    55               3  +
P      | 222               3311              2255                  33|
O      |2               333    11           555222                   |
N      |           33333         11111 55555      22222              |
S   .0 +***********5555555555555555555*1111111111111111**************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 38. Category probability curves of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.32	.13	M	-.10	.24	-.22	.27	-.80	127	.4265	.2207	-.08	78	Q78
F	-.68	.13	M	-.09	.24	-.59	.27	-2.16	124	.0330	.4410	-.04	79	Q79
F	.22	.14	M	.49	.26	-.27	.29	-.92	113	.3621	.3066	.51	80	Q80
F	-.45	.14	M	-.43	.24	-.02	.28	-.08	121	.9375	.9313	.49	85	Q85
F	-.49	.13	M	-.38	.24	-.10	.27	-.38	129	.7047	.6330	-.10	86	Q86
F	-.08	.13	M	-.38	.24	.30	.27	1.12	129	.2640	.5554	.28	87	Q87
F	.18	.14	M	-.17	.26	.35	.29	1.20	109	.2340	.8302	.46	88	Q88
F	.15	.14	M	-.46	.25	.61	.29	2.10	109	.0382	.0413	.75	92	Q92
F	.93	.14	M	1.22	.27	-.29	.30	-.97	112	.3336	.5984	.04	94	Q94
F	.45	.14	M	.15	.25	.30	.29	1.03	117	.3065	.7019	-.21	96	Q96
F	.13	.14	M	.13	.26	.00	.29	.00	113	1.000	.8403	-.56	98	Q98

Figure 39. Gender DIF of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
    SUMMARY OF 243 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN      20.9      10.3      -1.69     .60      1.01    -.2   1.00    -.2 |
| S.D.       7.1       1.6       1.84     .15       .66    1.7    .65    1.6 |
| MAX.      46.0      11.0       4.77    1.32      3.63    4.2   3.60    4.2 |
| MIN.       3.0       2.0      -5.29     .50       .05   -4.3    .05   -4.3 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .68 TRUE SD    1.72  SEPARATION  2.54  PERSON RELIABILITY  .87 |
|MODEL RMSE    .61 TRUE SD    1.74  SEPARATION  2.83  PERSON RELIABILITY  .89 |
| S.E. OF PERSON MEAN = .12                                                   |
-------------------------------------------------------------------------------
  MAXIMUM EXTREME SCORE:      2 PERSON
  MINIMUM EXTREME SCORE:     28 PERSON
      LACKING RESPONSES:      1 PERSON
        VALID RESPONSES:  93.5%  (APPROXIMATE)
    SUMMARY OF 11 MEASURED (NON-EXTREME) ITEM
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     497.0     253.8        .00     .12       .99    -.1    .99    -.1 |
| S.D.      41.6      11.0        .43     .00       .10    1.1    .10    1.1 |
| MAX.     550.0     272.0        .99     .13      1.15    1.6   1.17    1.8 |
| MIN.     437.0     241.0       -.54     .12       .83   -1.9    .83   -1.7 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .12 TRUE SD     .41  SEPARATION  3.36  ITEM   RELIABILITY  .92 |
|MODEL RMSE    .12 TRUE SD     .41  SEPARATION  3.43  ITEM   RELIABILITY  .92 |
| S.E. OF ITEM MEAN = .14                                                     |
-------------------------------------------------------------------------------
```

Figure 40. Separations and reliabilities of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
           PERSON - MAP - ITEM
               <more>|<rare>
    5             .  +
                  .  |
                     |
                     |
                     |
    4                +
                     |
                     |
                     |
                     |
    3             .  +
                  .  |
                  .  |
                     |
                     |
    2             . T+
                     |
                     |
               .###  |
                 .#  |
    1             .  +  Q94
                  .  |T
                     |
                .##  |S Q96
                .## S|  Q80    Q98
    0             .  +M Q88    Q92
               ####  |  Q78    Q87
                .##  |S Q85    Q86
               .###  |  Q79
               .###  |T
   -1                +
              #####  |
               .###  |
           .####### M|
                 ##  |
   -2            .#  +
              .####  |
             .#####  |
               .###  |
                  #  |
   -3          .###  +
                .##  |
                 .#  |
                ### S|
                 .#  |
   -4           .##  +
                  .  |
                .##  |
                  .  |
                  .  |
   -5                +
               .###  |
                    T|
                     |
                     |
   -6    .#########  +
               <less>|<frequ>
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 41. Person-item map of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
                <more>|
    5                . +
                     . |
                       |
                       |                   Q94 .45
                       |
    4                  +
                       |                   Q96 .45
                       |                   Q80 .45
                       |                   Q88 .45
                                           Q92 .45
                                           Q98 .45
                       |                   Q87 .45
    3                . +                   Q78 .45
                     . |                   Q79 .45
                                           Q85 .45
                                           Q86 .45
                     . |
                       |
                       |
    2                . T+
                       |
                       |
                  .### |
                    .# |
    1                . +
                     . |T        Q94 .25
                       |
                   .## |S
                   .## S|        Q96 .25
    0                . +M        Q80 .25
                  #### |         Q88 .25
                                 Q92 .25
                                 Q98 .25
                   .## |S        Q87 .25
                  .### |         Q78 .25
                  .### |T        Q79 .25
                                 Q85 .25
                                 Q86 .25
   -1                  +
                 ##### |
                  .### |
              .####### M|
                    ## |
   -2               .# +  Q94 .15
                 .#### |
                .##### |
                  .### |
                     # |  Q80 .15
                          Q96 .15
   -3             .### +  Q88 .15
                          Q92 .15
                          Q98 .15
                   .## |  Q87 .15
                    .# |  Q78 .15
                   ### S|  Q79 .15
                          Q85 .15
                          Q86 .15
                    .# |
   -4              .## +
                     . |
                   .## |
                     . |
                     . |
   -5                  +
                  .### |
                      T|
                       |
                       |
   -6       .######### +
                <less>|
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 42. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
78	87	-0.3055
79	92	-0.303
78	88	-0.2614
79	98	-0.2334
78	98	-0.2273
88	94	-0.2226
79	96	-0.2213
86	98	-0.217
79	87	-0.2106
88	92	-0.1999
80	98	-0.1952
87	98	-0.1901
79	85	-0.1816
79	88	-0.1791
78	86	-0.1787
85	86	-0.1786
78	85	-0.1743
80	96	-0.1682
85	87	-0.1667
78	94	-0.161
86	94	-0.1501
94	96	-0.1473
86	96	-0.1471
80	87	-0.1445
79	86	-0.1412
78	92	-0.1311
80	85	-0.1278
80	88	-0.1255
85	94	-0.1228
86	92	-0.1052
87	94	-0.1052
85	96	-0.0996
80	86	-0.0927
87	92	-0.0798
80	94	-0.0745
92	96	-0.073
85	88	-0.0723
79	94	-0.0576
92	98	-0.0464
80	92	-0.0451
78	80	-0.044
87	96	-0.0438
92	94	-0.0209
96	98	-0.0189
88	98	0.0027
86	88	0.0045
88	96	0.0129
78	96	0.0209
79	80	0.0477
85	92	0.082
85	98	0.0823
87	88	0.0872
94	98	0.1059
86	87	0.2251
78	79	0.2767

Figure 43. Correlations of residuals for each item pair of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-6       -4        -2         0         2         4         6
|---------+---------+---------+---------+---------+---------| NUM   ITEM
1              1    :      2      :       3         :    5  5  94  Q94
|                                                           |
|                                                           |
1           1   :       2      :       3         :    5     5  96  Q96
1          1    :      2      :        3        :    5      5  80  Q80
|                                                           |
1         1    :      2      :        3        :     5      5  98  Q98
1         1    :      2      :        3        :    5       5  88  Q88
1         1    :      2      :       3         :    5       5  92  Q92
|                                                           |
1        1    :      2      :        3        :    5        5  87  Q87
1       1    :      2      :        3        :     5        5  78  Q78
|                                                           |
1      1    :       2     :        3        :     5         5  85  Q85
1      1    :      2      :        3        :     5         5  86  Q86
1      1    :      2      :        3        :    5          5  79  Q79
|---------+---------+---------+---------+---------+---------| NUM   ITEM
-6       -4        -2         0         2         4         6

2   1          1 111  211 11 1       1
62  1 1171849471306346215 0072177 2150  1  122        1     2 PERSON
       S           M           S           T
0 10      20   30 40 50 70  80  90                    99       PERCENTILE
```

Figure 44. Construct keymap of the 11-item group 2 comprising items Q78-80, Q85-88, Q92, Q94, Q96, Q98 after combining categories 3 and 4; and adjusting 5 persons' responses to item Q79, 6 persons' responses to item Q94, and 7 persons' responses to item Q80

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     470  27| -2.52 -2.57|  1.22  1.10||  NONE   |( -3.80)| 1
|  2   2     627  35| -1.29 -1.22|   .84   .85||  -2.64  |  -1.48 | 2
|  3   3     396  22|  -.07  -.13|   .86   .86||   -.20  |    .38 | 3
|  4   4     138   8|   .87   .77|   .83   .82||   1.38  |   1.57 | 4
|  5   5     139   8|  1.68  1.77|  1.20  1.45||   1.46  |(  2.97)| 5
|-------------------+------------+------------++---------+--------|
|MISSING     111   6| -1.15      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 45. Category structure of the initial 7-item group 3 comprising items Q91, Q93, Q95, Q97, Q99-101

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                         |
A      |                                                         |
B   .8 +1                                                       5+
I      | 11                                                   55 |
L      |   11                                               55   |
I      |     11                                            5     |
T   .6 +       1        2222222222                        5      +
Y      |        11   222          22                     5       |
    .5 +          122               2     333           5        +
O      |         2211                22333   333      55         |
F   .4 +        2    1               3322       33   5           +
       |      22      11           33    2        3 5            |
R      |    22          11       33       2     444**44444       |
E      |  22              1    33          22 44  5  3    444    |
S   .2 +22                 1133            44*2 55    33     444 +
P      |                  333111         44    *        33      4|
O      |               333      111   444   555 222       333    |
N      |         333333          44***11*555       2222      3333|
S   .0 +*************************5555555 11111111111111**********+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -4      -3      -2      -1       0       1       2       3
        PERSON [MINUS] ITEM MEASURE
```

Figure 46. Category probability curves of the initial 7-item group 3 comprising items Q91, Q93, Q95, Q97, Q99-101

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                       |
B      |                                                      5|
A      |                                                    55 |
B   .8 +1                                                 55   +
I      | 1                                              55     |
L      |  1                          33333333          5       |
I      |   11         222          33        33       5        |
T   .6 +     1     222   222      3            3    55         +
Y      |      1  22         2   33              33 5           |
    .5 +       12           223                  *             +
O      |       21            32                 5 3            |
F   .4 +     22  1           3  2               5   3          +
       |    2     11       33    22            5     33        |
R      |  22        1     3        2         55       3        |
E      | 2           1   3          22      5           33     |
S   .2 +2             1*3             2   55              33   +
P      |             33 11             2*5                  33 |
O      |           33     11         555 222                  3|
N      |      33333         1111*5555       22222              |
S   .0 +******555555555555555555 1111111111111111**************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 47. Category probability curves of the 7-item group 3 comprising items Q91, Q93, Q95, Q97, Q99-101, after combining categories 3 and 4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                          +
O      |                                                          |
B      |                                                        44|
A      |11                                                   444  |
B   .8 +  111                                              44     +
I      |     1                                           44       |
L      |      11                                        4         |
I      |        11          2222                      44          |
T   .6 +          1      222     222                 4            +
Y      |           1   22           2               4             |
    .5 +            1*2              22   333333   4              +
O      |            2 1                233      3**               |
F   .4 +          22   1              3322      4  33             +
       |        22      11          33   2    4     33            |
R      |      2          1         3      2  4        3           |
E      |    22            11   33          **          33         |
S   .2 +  22                133          4  2            333      +
P      |222               33111       44     22             333   |
O      |               333     11  444        222              33|
N      |         333333        44**111          22222             |
S   .0 +***********44444444444444      1111111111111111*********+
E      -+------+------+------+------+------+------+------+------+-
       -4     -3     -2     -1      0      1      2      3      4
        PERSON [MINUS] ITEM MEASURE
```

Figure 48. Category probability curves of the 7-item group 3 comprising items Q91, Q93, Q95, Q97, Q99-101, after combining categories 4 and 5

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	470	27	-2.67	-2.70	1.10	1.12	NONE	(-3.89)	1
2	2	627	35	-1.29	-1.22	.85	.85	-2.74	-1.51	2
3	3	534	30	.50	.42	.88	.90	-.27	1.38	3
5	4	139	8	2.46	2.59	1.28	1.20	3.00	(4.13)	5
MISSING		111	6	-1.10						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 49. Category structure of the 7-item group 3 comprising items Q91, Q93, Q95, Q97, Q99-101, after combining categories 3 and 4

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD		PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
95	593	242	-.40	.12	1.69	6.1	1.64	5.6	A	.73	.81	56.3	62.2	Q95
100	526	253	.58	.12	.99	-.1	1.00	.1	B	.78	.79	63.7	61.0	Q100
97	536	254	.44	.12	.96	-.4	.94	-.6	C	.79	.79	65.6	61.2	Q97
91	603	254	-.35	.12	.86	-1.5	.89	-1.1	D	.81	.80	66.7	62.1	Q91
99	595	253	-.20	.12	.89	-1.2	.88	-1.3	c	.83	.81	67.7	62.2	Q99
93	624	260	-.43	.12	.87	-1.4	.86	-1.5	b	.83	.80	69.1	62.2	Q93
101	544	254	.37	.12	.75	-3.0	.75	-2.9	a	.83	.79	67.9	61.8	Q101
MEAN	574.4	252.9	.00	.12	1.00	-.2	1.00	-.3				65.3	61.8	
S.D.	35.4	5.0	.41	.00	.29	2.7	.27	2.5				4.0	.5	

Figure 50. Item statistics of the 7-item group 3 comprising items Q91, Q93, Q95, Q97, Q99-

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

101, after combining categories 3 and 4

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
97	536	254	.44	.13	1.10	1.0	1.07	.8	A .80	.82	68.0	65.4	Q97
100	526	253	.61	.13	1.05	.6	1.07	.8	B .81	.82	65.6	65.3	Q100
93	624	260	-.62	.13	1.01	.2	1.00	.0	C .83	.83	67.8	66.2	Q93
91	603	254	-.50	.13	.99	.0	1.01	.1	c .83	.83	64.1	66.1	Q91
99	595	253	-.31	.13	1.00	.1	.96	-.4	b .85	.84	69.7	66.2	Q99
101	544	254	.37	.13	.81	-2.1	.82	-1.9	a .85	.83	68.9	65.9	Q101
MEAN	571.3	254.7	.00	.13	1.00	.0	.99	-.1			67.4	65.9	
S.D.	37.4	2.4	.49	.00	.09	1.0	.09	.9			1.9	.4	

Figure 51. Item statistics of the 6-item group 3 comprising items Q91, Q93, Q97, Q99-101, after combining categories 3 and 4, and removing item Q95

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	14.8	100.0%		100.0%
Raw variance explained by measures	=	8.8	59.5%		59.4%
Raw variance explained by persons	=	6.6	44.7%		44.6%
Raw Variance explained by items	=	2.2	14.8%		14.8%
Raw unexplained variance (total)	=	6.0	40.5%	100.0%	40.6%
Unexplned variance in 1st contrast	=	1.6	10.8%	26.6%	
Unexplned variance in 2nd contrast	=	1.3	8.4%	20.9%	
Unexplned variance in 3rd contrast	=	1.2	8.3%	20.4%	
Unexplned variance in 4th contrast	=	1.1	7.4%	18.4%	
Unexplned variance in 5th contrast	=	.8	5.6%	13.7%	

Figure 52. Standardized residual variance of the 6-item group 3 comprising items Q91, Q93, Q97, Q99-101, after combining categories 3 and 4, and removing item Q95

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	404	26	-3.36	-3.37	1.06	1.06	NONE	(-4.46)	1
2	2	556	36	-1.57	-1.54	.92	.93	-3.33	-1.83	2
3	3	464	30	.65	.61	.94	.95	-.32	1.67	3
5	4	104	7	3.19	3.26	1.18	1.08	3.65	(4.76)	5
MISSING		74	5	-1.58						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 53. Category structure of the 6-item group 3 comprising items Q91, Q93, Q97, Q99-101, after combining categories 3 and 4, and removing item Q95

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P     -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                           +
O      |                                                           |
B      |                                                           |
A      |1                                                          |
B   .8 + 11                                   333                 5+
I      |   11                             3333   3333           55 |
L      |     1          22222            3           3         5   |
I      |      1       22     22        33            33       5    |
T   .6 +       11   22         22     3                3    55     +
Y      |         1  2            2   3                  33 5       |
    .5 +          *2              2*3                     *        +
O      |         2 1              3 2                    5 3       |
F   .4 +        2   1            3   2                  5   3      +
       |      22     1          3     22              55     33    |
R      |     2       11       33        2            5         3   |
E      |   22          1     3           22        55           33 |
S   .2 + 22             11 33              2      5               3+
P      |2                3*1                222 555                |
O      |               33   11               55*22                 |
N      |          33333       11111     55555     22222            |
S   .0 +**********55555555555555555*****11111111111111*************+
E     -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
      -5    -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 54. Category probability curves of the 6-item group 3 comprising items Q91, Q93, Q97, Q99-101, after combining categories 3 and 4, and removing item Q95

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	-.50	.15	M	-.55	.25	.05	.29	.17	125	.8620	.6642	-.52	91	Q91
F	-.59	.14	M	-.71	.26	.12	.30	.39	119	.6951	.6227	.18	93	Q93
F	.59	.15	M	.01	.25	.58	.29	1.99	128	.0482	.0154	.40	97	Q97
F	-.31	.15	M	-.34	.25	.03	.29	.10	128	.9228	.9548	-.35	99	Q99
F	.44	.15	M	1.12	.25	-.68	.29	-2.31	131	.0222	.0428	-.64	100	Q100
F	.34	.15	M	.46	.25	-.12	.29	-.42	130	.6757	.5992	-.83	101	Q101

Figure 55. Gender DIF of the 6-item group 3 comprising items Q91, Q93, Q97, Q99-101, after combining categories 3 and 4, and removing item Q95

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	-.42	.15	M	-.30	.26	-.12	.30	-.40	126	.6892	.3686	-.15	91	Q91
F	-.52	.15	M	-.47	.26	-.05	.30	-.15	119	.8793	.9594	-.04	93	Q93
F	.73	.15	M	.23	.26	.49	.30	1.64	125	.1043	.0461	.98	97	Q97
F	-.20	.15	M	-.15	.26	-.06	.30	-.18	126	.8541	.6587	-.30	99	Q99
F	.45	.15	M	.69	.26	-.24	.30	-.78	128	.4348	.4308	-.94	101	Q101

Figure 56. Gender DIF of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
97	536	254	.60	.13	1.11	1.2	1.09	1.0	A .81	.83	67.9	66.3	Q97
93	624	260	-.52	.13	1.03	.3	1.02	.3	B .84	.84	70.5	67.3	Q93
99	595	253	-.20	.13	1.01	.1	.97	-.2	C .86	.85	70.5	66.9	Q99
91	603	254	-.39	.13	.98	-.2	.97	-.3	b .84	.84	66.4	67.2	Q91
101	544	254	.51	.13	.85	-1.7	.84	-1.7	a .86	.84	70.2	66.6	Q101
MEAN	580.4	255.0	.00	.13	.99	-.1	.98	-.2			69.1	66.9	
S.D.	34.4	2.5	.47	.00	.08	.9	.08	.9			1.7	.4	

Figure 57. Item statistics of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	12.4	100.0%		100.0%
Raw variance explained by measures	=	7.4	59.6%		59.4%
Raw variance explained by persons	=	5.6	45.0%		44.9%
Raw Variance explained by items	=	1.8	14.5%		14.5%
Raw unexplained variance (total)	=	5.0	40.4%	100.0%	40.6%
Unexplned variance in 1st contrast	=	1.7	13.7%	33.8%	
Unexplned variance in 2nd contrast	=	1.3	10.4%	25.6%	
Unexplned variance in 3rd contrast	=	1.1	9.3%	22.9%	
Unexplned variance in 4th contrast	=	.9	7.1%	17.6%	
Unexplned variance in 5th contrast	=	.0	.0%	.1%	

Figure 58. Standardized residual variance of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
97	536	254	.60	.13	1.11	1.2	1.09	1.0	A .79	.82	67.9	66.3	Q97
93	624	260	-.52	.13	1.03	.3	1.02	.3	B .80	.79	70.5	67.3	Q93
99	595	253	-.20	.13	1.01	.1	.97	-.2	C .84	.82	70.5	66.9	Q99
91	603	254	-.39	.13	.98	-.2	.97	-.3	b .81	.82	66.4	67.2	Q91
101	544	254	.51	.13	.85	-1.7	.84	-1.7	a .82	.81	70.2	66.6	Q101
MEAN	580.4	255.0	.00	.13	.99	-.1	.98	-.2			69.1	66.9	
S.D.	34.4	2.5	.47	.00	.08	.9	.08	.9			1.7	.4	

Figure 59. Item statistics, with point-biserial correlations, of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     321  25| -3.34 -3.39|  1.10  1.10||  NONE   |( -4.67)| 1
|  2   2     467  37| -1.66 -1.61|   .91   .90||   -3.54 |  -1.95 | 2
|  3   3     394  31|   .77   .71|   .93   .93||    -.35 |   1.77 | 3
|  5   4      93   7|  3.44  3.52|  1.15  1.06||    3.89 |(  5.00)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      58   4| -1.33      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 60. Category structure of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                          555|
B      |                                                       555   |
A      |                                                     55      |
B   .8 +11                             3333333             55        +
I      |  1                          33       33             5       |
L      |   1         222222         3           3           5        |
I      |    1      22      2       3             3       5           |
T   .6 +     1    2         22    3               3     5            +
Y      |      1  2            2  3                 3  5              |
    .5 +       *2              23                   35               +
O      |      2 1              32                   53               |
F   .4 +     2   1            3  2                 5  3              +
       |    2     1         33    2              55    33            |
R      |   2       1       3       2            5        3           |
E      |  2         1     3         22         5          3          |
S   .2 +22           11  3            2       5            33        +
P      |               *3              22   55               33      |
O      |             33 111              ***                   333   |
N      |         3333      1111     55555   2222                  333|
S   .0 +*********55555555555555*****11111111111**********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -5        -3        -1         1         3         5         7
        PERSON [MINUS] ITEM MEASURE
```

Figure 61. Category probability curves of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 231 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	11.4	4.7	-.76	.91	.98	-.2	.98	-.2
S.D.	3.9	.7	2.30	.14	.95	1.4	.96	1.4
MAX.	23.0	5.0	5.35	1.85	7.55	5.5	7.81	5.5
MIN.	2.0	1.0	-5.01	.82	.00	-2.5	.00	-2.5

REAL RMSE 1.05 TRUE SD 2.05 SEPARATION 1.94 PERSON RELIABILITY .79
MODEL RMSE .92 TRUE SD 2.11 SEPARATION 2.28 PERSON RELIABILITY .84
S.E. OF PERSON MEAN = .15

MAXIMUM EXTREME SCORE: 5 PERSON
MINIMUM EXTREME SCORE: 34 PERSON
LACKING RESPONSES: 4 PERSON

SUMMARY OF 5 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	580.4	255.0	.00	.13	.99	-.1	.98	-.2
S.D.	34.4	2.5	.47	.00	.08	.9	.08	.9
MAX.	624.0	260.0	.60	.13	1.11	1.2	1.09	1.0
MIN.	536.0	253.0	-.52	.13	.85	-1.7	.84	-1.7

REAL RMSE .13 TRUE SD .45 SEPARATION 3.35 ITEM RELIABILITY .92
MODEL RMSE .13 TRUE SD .45 SEPARATION 3.40 ITEM RELIABILITY .92
S.E. OF ITEM MEAN = .23

DELETED: 2 ITEM

Figure 60. Separations and reliabilities of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   6            .#  +
                    |
                    |
                 #  |
                    |
   5                +
                    |
                    |
                ##  |
                    |
   4             .  +
                   T|
                .#  |
                    |
                    |
   3             .  +
                ##  |
                    |
                    |
                    |
   2                +
           .######  |
                   S|
                 .  |
                    |
   1                +T
          .#######  |
                 .  |  Q101   Q97
                    |S
                 .  |
   0       .######  +M
                 .  |  Q99
                 .  |S Q91
            ######  |  Q93
                   M|
  -1             #  +T
          .#######  |
                    |
                    |
                .#  |
  -2  ############  +
                    |
                 .  |
            ######  |
                 .  |
  -3               S+
                 .  |
             .####  |
                    |
                 .  |
  -4           .##  +
                    |
                 .  |
                 .  |
                    |
  -5           .##  +
                    |
                   T|
                    |
                    |
  -6  .###########  +
              <less>|<frequ>
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 61. Person-item map of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
                <more>|
    6             .#  +
                      |
                      |
                   #  |
                      |
    5                 +
                      |
                      |                    Q97 .45
                  ##  |                    Q101.45
                      |
    4              .  +
                     T|                    Q99 .45
                  .#  |                    Q91 .45
                      |                    Q93 .45
                      |
    3              .  +
                  ##  |
                      |
                      |
                      |
    2                 +
             .######  |
                     S|
                   .  |
                      |
    1                 +T
            .#######  |
                   .  |
                      |S         Q97 .25
                   .  |          Q101.25
    0        .######  +M
                   .  |
                   .  |S         Q99 .25
              ######  |          Q91 .25
                     M|          Q93 .25
   -1              #  +T
            .#######  |
                      |
                      |
                  .#  |
   -2   ############  +
                      |
                   .  |
              ######  |
                   .  |
   -3                S+ Q97 .15
                   .  | Q101.15
               .####  |
                      |
                   .  | Q99 .15
   -4            .##  + Q91 .15
                      | Q93 .15
                   .  |
                   .  |
                      |
   -5            .##  +
                      |
                     T|
                      |
                      |
   -6   .###########  +
                <less>|
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 62. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
91	99	-0.4637
93	97	-0.3874
93	101	-0.3118
93	99	-0.3058
91	97	-0.2858
97	101	-0.2644
91	101	-0.2456
97	99	-0.1347
99	101	-0.0743
91	93	-0.012

Figure 63. Correlations of residuals for each item pair of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-6       -4        -2         0         2         4         6
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
1         1    :       2        :         3          :    5 5   97  Q97
1        1    :        2       :         3          :     5 5  101  Q101
|                                                           |
|                                                           |
1     1    :       2        :         3          :    5     5   99  Q99
1    1    :       2        :         3          :    5      5   91  Q91
1   1    :        2       :         3          :    5       5   93  Q93
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
-6       -4        -2         0         2         4         6

2    1       1   1  3   2  1  1   2    2
81 3 0 22 82 31 182 64  33 81191 22  1 0    62  5 1 6    3  5  PERSON
        S              M              S               T
0 10     20      30 40  50 60 70  80        90              99  PERCENTILE
```

Figure 64. Construct keymap of the 5-item group 3 comprising items Q91, Q93, Q97, Q99, and Q101, after combining categories 3 and 4, and removing items Q95 and Q100

The Education University
of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 22: Discrimination's work-in-progress figures and tables

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                -- Empirical --    Modeled
Total raw variance in observations     =        48.9 100.0%         100.0%
  Raw variance explained by measures   =        29.9  61.1%          62.9%
    Raw variance explained by persons  =        25.7  52.5%          54.0%
    Raw Variance explained by items    =         4.2   8.6%           8.8%
  Raw unexplained variance (total)     =        19.0  38.9% 100.0%   37.1%
    Unexplned variance in 1st contrast =         2.8   5.7%  14.8%
    Unexplned variance in 2nd contrast =         2.6   5.3%  13.6%
    Unexplned variance in 3rd contrast =         1.6   3.2%   8.3%
    Unexplned variance in 4th contrast =         1.4   2.9%   7.4%
    Unexplned variance in 5th contrast =         1.1   2.3%   5.9%
```

Figure 1. Standardized residual variance of initial Discrimination dimension

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM
1	.79	-1.48	1.80	1.93	A 118	Q118	-.54	.39	.77	.77	a 105	Q105
1	.72	-1.18	1.69	1.77	B 116	Q116	-.45	.82	.83	.64	b 112	Q112
1	.48	-.33	1.00	.95	C 119	Q119	-.43	-.13	.89	.95	c 103	Q103
1	.28	.36	1.01	.79	D 120	Q120	-.39	.20	.68	.61	d 109	Q109
1	.11	.11	.80	.73	E 117	Q117	-.38	-.11	.68	.73	e 107	Q107
1	.05	-.65	.97	.95	F 102	Q102	-.28	-.47	.76	.87	f 104	Q104
							-.27	1.08	1.44	1.08	g 110	Q110
							-.26	.22	.88	.77	h 106	Q106
							-.24	.46	1.21	1.14	i 113	Q113
							-.18	.01	1.11	1.23	J 111	Q111
							-.16	.43	.77	.77	I 115	Q115
							-.15	.37	1.08	.89	H 114	Q114
							-.07	-.11	1.06	.92	G 108	Q108

Figure 2. Standardized residual loadings for items in the first contrast of initial Discrimination dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
       STANDARDIZED RESIDUAL CONTRAST 1 PLOT

      -2              -1               0               1               2
      -+---------------+---------------+---------------+---------------+- COUNT
   .8 +        A                       |                                + 1
      |                                |                                |
   .7 +            B                   |                                + 1
      |                                |                                |
   .6 +                                |                                +
C     |                                |                                |
O  .5 +                           C    |                                + 1
N     |                                |                                |
T  .4 +                                |                                +
R     |                                |                                |
A  .3 +                                |     D                          + 1
S     |                                |                                |
T  .2 +                                |                                +
      |                                |                                |
1  .1 +                                | E                              + 1
      |                      F         |                                | 1
L  .0 +--------------------------------|--------------------------------+
O     |                              G |                                | 1
A -.1 +                                |                                +
D     |                                |     HI                         | 2
I -.2 +                                J                                + 1
N     |                                |  h   i         g               | 3
G -.3 +                        f       |                                + 1
      |                                |                                |
  -.4 +                              e |  d                             + 2
      |                              c |            b                   | 2
  -.5 +                                |                                +
      |                                |     a                          | 1
      -+---------------+---------------+---------------+---------------+-
      -2              -1               0               1               2
                                 ITEM MEASURE
 COUNT:        1    1        1 1  1  3 1 12  32     1   1
```

Figure 3. The principal component analysis plot of item loading for the first contrast of the initial Discrimination dimension

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
120	429	232	1.32	.13	1.18	1.6	1.16	1.3	A .79	.81	64.9	63.2	Q120
119	515	243	.49	.12	.98	-.1	.94	-.5	B .85	.85	69.5	61.3	Q119
116	654	259	-.74	.11	.95	-.5	.96	-.3	b .88	.88	61.4	57.5	Q116
118	653	248	-1.07	.11	.88	-1.2	.86	-1.4	a .90	.89	61.5	56.5	Q118
MEAN	562.8	245.5	.00	.12	1.00	.0	.98	-.3			64.3	59.6	
S.D.	95.7	9.7	.96	.01	.11	1.0	.11	1.0			3.3	2.8	

Figure 4. Item statistics of group 1 comprising items Q116, Q118, Q119, and Q120.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
120	429	232	1.32	.13	1.18	1.6	1.16	1.3	A .79	.82	64.9	63.2	Q120
119	515	243	.49	.12	.98	-.1	.94	-.5	B .83	.84	69.5	61.3	Q119
116	654	259	-.74	.11	.95	-.5	.96	-.3	b .84	.82	61.4	57.5	Q116
118	653	248	-1.07	.11	.88	-1.2	.86	-1.4	a .85	.83	61.5	56.5	Q118
MEAN	562.8	245.5	.00	.12	1.00	.0	.98	-.3			64.3	59.6	
S.D.	95.7	9.7	.96	.01	.11	1.0	.11	1.0			3.3	2.8	

Figure 5. Item statistics of 4-item group 1 comprising items Q116, Q118, Q119, and Q120, showing point biserial correlations

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	12.8	100.0%		100.0%
Raw variance explained by measures	=	8.8	68.7%		68.3%
Raw variance explained by persons	=	6.4	50.4%		50.1%
Raw Variance explained by items	=	2.3	18.3%		18.2%
Raw unexplained variance (total)	=	4.0	31.3%	100.0%	31.7%
Unexplned variance in 1st contrast	=	1.8	14.3%	45.6%	
Unexplned variance in 2nd contrast	=	1.2	9.4%	30.1%	
Unexplned variance in 3rd contrast	=	1.0	7.5%	24.0%	
Unexplned variance in 4th contrast	=	.0	.1%	.3%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 6. Standardized residual variance of 4-item group 1 comprising items Q116, Q118, Q119, and Q120

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	304	31	-3.88	-3.93	1.19	1.11	NONE	(-4.79)	1
2	2	321	33	-2.00	-1.97	.91	.94	-3.66	-2.15	2
3	3	200	20	-.20	-.20	.87	.87	-.60	.39	3
4	4	80	8	1.44	1.38	1.01	1.01	1.52	2.18	4
5	5	77	8	2.94	2.93	.99	.99	2.73	(4.01)	5
MISSING		55	5	-1.83						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 7. Category structure of the 4-item group 1 comprising items Q116, Q118, Q119, and Q120

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                             +
O      |                                                             |
B      |                                                           55|
A      |                                                         55  |
B   .8 +1                                                      55    +
I      | 11                                                  55      |
L      |   1           22222                                5        |
I      |    1        22     22                             5         |
T   .6 +     11    22         22        33                5          +
Y      |       1  2             2    333  333            5           |
    .5 +        *2               2233        3          5            +
O      |       2 1                32          3 44444445             |
F   .4 +      2   1              3  2         4*3     544            +
       |    22     1           33    2       4   3   5   44          |
R      |   2        11        3       2    44     3 5      4         |
E      | 22           1     33         22 4        *        44       |
S   .2 +2              11  3            4*       55 3          44    +
P      |                 **            4  22    5    33         444  |
O      |              333  111      444     2255       33          44|
N      |         33333        11**44      55552222       3333        |
S   .0 +************************55********11111111*******************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 8. Category probability curves of the 4-item group 1 comprising items Q116, Q118, Q119, and Q120

DIF class specification is: DIF=@GENDER

PERSON	DIF	DIF	PERSON	DIF	DIF	DIF	JOINT	Welch			MantelHanzl		ITEM	
CLASS	MEASURE	S.E.	CLASS	MEASURE	S.E.	CONTRAST	S.E.	t	d.f.	Prob.	Prob.	Size	Number	Name
F	-.80	.13	M	-.56	.22	-.24	.25	-.96	111	.3398	.6835	-.06	116	Q116
F	-1.07	.13	M	-1.07	.23	.00	.26	.00	100	1.000	.8607	-.08	118	Q118
F	.54	.14	M	.35	.24	.19	.28	.70	107	.4876	.4006	.48	119	Q119
F	1.35	.15	M	1.21	.28	.14	.32	.45	89	.6532	.8470	.28	120	Q120

Figure 9. Gender DIF of the 4-item group 1 comprising items Q116, Q118, Q119, and Q120

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 214 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	9.1	3.7	-1.34	.89	.95	-.2	.96	-.2
S.D.	3.5	.6	2.08	.18	1.08	1.2	1.12	1.2
MAX.	19.0	4.0	4.36	1.78	6.45	3.7	6.65	3.7
MIN.	2.0	1.0	-5.04	.69	.00	-2.8	.00	-2.7

REAL RMSE 1.05 TRUE SD 1.79 SEPARATION 1.70 PERSON RELIABILITY .74
MODEL RMSE .91 TRUE SD 1.87 SEPARATION 2.06 PERSON RELIABILITY .81
S.E. OF PERSON MEAN = .14

MAXIMUM EXTREME SCORE: 11 PERSON
MINIMUM EXTREME SCORE: 40 PERSON
LACKING RESPONSES: 9 PERSON

SUMMARY OF 4 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	562.8	245.5	.00	.12	1.00	.0	.98	-.3
S.D.	95.7	9.7	.96	.01	.11	1.0	.11	1.0
MAX.	654.0	259.0	1.32	.13	1.18	1.6	1.16	1.3
MIN.	429.0	232.0	-1.07	.11	.88	-1.2	.86	-1.4

REAL RMSE .12 TRUE SD .95 SEPARATION 7.88 ITEM RELIABILITY .98
MODEL RMSE .12 TRUE SD .95 SEPARATION 8.10 ITEM RELIABILITY .98
S.E. OF ITEM MEAN = .55

Figure 10. Separations and reliabilities of the 4-item group 1 comprising items Q116, Q118, Q119, and Q120

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
              PERSON - MAP - ITEM
                  <more>|<rare>
 5                 .##  +
                        |
                        |
                     .  |
                        |
 4                      +
                        |
                        |
                     .  |
                        |
 3                      +
                     . T|
                        |
                        |
                    .#  |
 2                      +T
                    .#  |
                        |
                        |  Q120
                   .##  |
 1                      +S
                    .# S|
                     #  |
                 .####  |  Q119
                     .  |
 0                   .  +M
                 .####  |
                        |
                     #  |
                  .###  |  Q116
-1                      +S Q118
                        |
                 .#### M|
                     .  |
                     .  |
-2                      +T
           .##########  |
                     .  |
                     .  |
                        |
-3               .####  +
                     .  |
                       S|
                        |
                 .####  |
-4                   .  +
                        |
                        |
                     .  |
                        |
-5                ####  +
                        |
                        |
                       T|
                        |
-6          ##########  +
                  <less>|<frequ>
EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 11. Person-item map of the 4-item group 1 comprising items Q116, Q118, Q119, and Q120

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    5           .##  +
                     |
                     |                             Q120.45
                  .  |
                     |
    4                +
                     |
                     |                             Q119.45
                  .  |
                     |
    3                +
                  . T|
                     |                    Q120.35
                     |                             Q116.45
                 .#  |                             Q118.45
    2                +T
                 .#  |                    Q119.35
                     |
                     |
                .##  |
    1                +S
                 .# S|
                  #  |           Q120.25  Q116.35
              .####  |
                  .  |                    Q118.35
    0             .  +M
              .####  |           Q119.25
                     |
                  #  |
               .###  |
   -1                +S
                     |
              .#### M|           Q116.25
                  .  |
                  .  |           Q118.25
   -2                +T
        .##########  |
                  .  |  Q120.15
                  .  |
                     |
   -3         .####  +
                  .  |  Q119.15
                    S|
                     |
              .####  |
   -4             .  +
                     |
                     |
                  .  |  Q116.15
                     |  Q118.15
   -5          ####  +
                     |
                     |
                    T|
                     |
   -6    ##########  +
               <less>|
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 12. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 4-item group 1 comprising items Q116, Q118, Q119, and Q120

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
116	119	-0.522
118	120	-0.4728
116	120	-0.4223
118	119	-0.3859
116	118	-0.162
119	120	-0.0028

Figure 13. Correlations of residuals for each item pair of the 4-item group 1 comprising items Q116, Q118, Q119, and Q120

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-6       -4        -2         0         2         4         6
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
1            1    :       2      :     3   :    4    :   5  5  120  Q120
|                                                           |
1        1    :       2      :    3    :   4    :   5       5  119  Q119
|                                                           |
|                                                           |
1 1    :        2      :    3   :    4    :   5             5  116  Q116
11    :       2      :     3   :    4    :   5              5  118  Q118
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
-6       -4        -2         0         2         4         6

3    1     1   1   4   1  1  1  1
6 1126 1  17  17 212 219  54 712746 9  5 6  3  34   2 3   4    PERSON
      S              M             S              T
0 10 20       30  50  60    70 80     90                 99    PERCENTILE
```

Figure 14. Construct keymap of the 4-item group 1 comprising items Q116, Q118, Q119, and Q120

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
117	438	226	.65	.15	1.26	2.1	1.19	1.6	A .87	.89	64.9	67.5	Q117
108	493	242	.22	.14	.91	-.8	.88	-1.1	B .91	.90	74.7	68.0	Q108
102	583	258	-.87	.13	.87	-1.3	.81	-1.8	a .92	.91	74.2	64.6	Q102
MEAN	504.7	242.0	.00	.14	1.01	.0	.96	-.4			71.3	66.7	
S.D.	59.8	13.1	.64	.01	.17	1.5	.17	1.5			4.5	1.5	

Figure 15. Item statistics of 3-item group 2 comprising items Q102, Q108, and Q117

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
117	438	226	.65	.15	1.26	2.1	1.19	1.6	A .85	.88	64.9	67.5	Q117
108	493	242	.22	.14	.91	-.8	.88	-1.1	B .90	.88	74.7	68.0	Q108
102	583	258	-.87	.13	.87	-1.3	.81	-1.8	a .87	.87	74.2	64.6	Q102
MEAN	504.7	242.0	.00	.14	1.01	.0	.96	-.4			71.3	66.7	
S.D.	59.8	13.1	.64	.01	.17	1.5	.17	1.5			4.5	1.5	

Figure 16. Item statistics of 3-item group 2 comprising items Q102, Q108, and Q117, showing point-biserial correlations

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --		Modeled
Total raw variance in observations =	10.8	100.0%		100.0%
Raw variance explained by measures =	7.8	72.3%		72.3%
Raw variance explained by persons =	7.4	68.4%		68.5%
Raw Variance explained by items =	.4	3.9%		3.9%
Raw unexplained variance (total) =	3.0	27.7%	100.0%	27.7%
Unexplned variance in 1st contrast =	1.6	14.7%	53.0%	
Unexplned variance in 2nd contrast =	1.4	12.9%	46.7%	
Unexplned variance in 3rd contrast =	.0	.1%	.2%	
Unexplned variance in 4th contrast =	.0	.0%	.0%	
Unexplned variance in 5th contrast =	.0	.0%	.0%	

Figure 17. Standardized residual variance of 3-item group 2 comprising items Q102, Q108, and Q117

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	262	36	-5.12	-5.11	1.11	1.00	NONE	(-6.20)	1
2	2	263	36	-2.90	-2.89	.96	.93	-5.09	-2.90	2
3	3	119	16	-.12	-.10	.91	.89	-.69	.68	3
4	4	41	6	2.36	2.16	.90	.91	2.14	2.92	4
5	5	41	6	3.72	3.90	1.25	1.20	3.64	(4.88)	5
MISSING		47	6	-3.06						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 18. Category structure of 3-item group 2 comprising items Q102, Q108, and Q117

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                             |
B      |                                                             |
A      |11                                                           |
B   .8 +  11             22222222                                   5+
I      |    1          22        22                                5 |
L      |     1        2            2                              5  |
I      |      1      2              2       333333               5   |
T   .6 +       11   2                2    33      3             5    +
Y      |         1 2                  2  3         3           5     |
    .5 +         12                    23           3  444444 5      +
O      |         21                    32            34      *       |
F   .4 +        2  11                 3  2           43     5 44     +
       |      22     1               3    2        44   3   5   4    |
R      |     2        1            33      2      4     3   5    4   |
E      |    2          1          3         2    4       35       44 |
S   .2 +  22            11       3           22 4       553         4+
P      |22                1    33             4*       5   33        |
O      |                   1**3             44  22   55      33      |
N      |               33333  11111     4444      ***2         333   |
S   .0 +******************************************1111***************+
E      -+---------+---------+---------+---------+---------+---------+-
       -7        -5        -3        -1         1         3         5
        PERSON [MINUS] ITEM MEASURE
```

Figure 19. Category probability curves of 3-item group 2 comprising items Q102, Q108, and Q117

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.70	.15	M	-1.41	.27	.70	.31	2.24	97	.0274	.0364	.25	102	Q102
F	.22	.16	M	.19	.30	.03	.34	.08	88	.9364	.8661	-.32	108	Q108
F	.43	.17	M	1.40	.33	-.98	.37	-2.64	81	.0099	.0322	-.45	117	Q117

Figure 20. Gender DIF of 3-item group 2 comprising items Q102, Q108, and Q117

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	752	45	-3.98	-3.96	1.13	1.02	NONE	(-4.35)	1
2	2	568	34	-1.92	-1.93	.92	.86	-3.22	-1.73	2
3	3	222	13	-.27	-.32	.88	.90	-.14	.43	3
4	4	84	5	.86	.86	1.05	1.15	1.27	1.80	4
5	5	63	4	1.54	1.70	1.24	1.36	2.09	(3.43)	5
MISSING		155	8	-1.78						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Figure 21. Category structure of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                       |
B      |                                                       |
A      |11                                                   55|
B   .8 +  11                                               55  +
I      |    1                                             5    |
L      |     11           22222                         55     |
I      |       1       222     22                      5       |
T   .6 +        1     2          2                    5        +
Y      |         1  22            22                 5         |
    .5 +          1*                2   33          5          +
O      |          2 1                *33  333      5           |
F   .4 +        22   1              3 2      34444*44          +
       |       2      1           33   2    443   5  44        |
R      |     22        1         3      2  4   335     4       |
E      |    2           11     33        24     53      44     |
S   .2 +  22              1  33         442   55  3       44   +
P      |22                 **         44   225     33       444|
O      |                 33  111    44     5522      33        |
N      |            33333       ****1   555    222     3333    |
S   .0 +************************55555***111111111**************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4
        PERSON [MINUS] ITEM MEASURE
```

Figure 22. Category probability curves of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
110	378	232	.94	.14	1.51	3.6	1.19	1.2	A .74	.78	68.5	68.4	Q110
104	553	253	-.94	.11	1.03	.3	1.08	.8	B .83	.85	61.8	55.9	Q104
106	462	242	-.10	.12	1.07	.6	.98	-.1	C .82	.82	70.1	61.9	Q106
111	494	247	-.35	.11	.93	-.6	1.01	.1	D .83	.83	64.1	59.8	Q111
113	437	239	.17	.12	.99	.0	.92	-.7	c .82	.81	73.2	63.5	Q113
114	431	235	.11	.12	.93	-.6	.84	-1.4	b .83	.81	69.0	63.4	Q114
115	450	241	.17	.12	.77	-2.1	.81	-1.7	a .84	.82	71.0	63.1	Q115
MEAN	457.9	241.3	.00	.12	1.03	.2	.97	-.3			68.2	62.3	
S.D.	50.7	6.6	.53	.01	.21	1.6	.12	1.0			3.7	3.5	

Figure 23. Item statistics of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	752	45	-3.33	-3.31	1.09	1.02	NONE	(-3.67)	1
2	2	568	34	-1.20	-1.22	.90	.87	-2.54	-1.01	2
3	3	222	13	.54	.50	.94	.94	.62	1.29	3
4	4	147	9	1.97	2.04	1.14	1.21	1.92	(3.18)	4
MISSING		149	8	-1.24						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 24. Category structure of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 4 and 5

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                        4|
A      |                                                     444 |
B   .8 +11                                                 44    +
I      |  11                                             44      |
L      |    1             2222222                       4        |
I      |     11        222       22                   44         |
T   .6 +       1     22            22                4           +
Y      |        11  2                2              4            |
    .5 +          *2                  22   33333   4             +
O      |         2 1                    233     33*              |
F   .4 +       22   11                 332      44 33            +
       |      2       1              33   22   4     33          |
R      |    22         11          33       2 4        3         |
E      |  22             1       33          *          33       |
S   .2 +22                11   33          44 22          333    +
P      |                    1**          44     22           333 |
O      |                  333  111     44         22            3|
N      |            333333        *****             22222        |
S   .0 +************44444444444444     11111111111111111*********+
E      -+------+------+------+------+------+------+------+------+-
       -4     -3     -2     -1      0      1      2      3      4
        PERSON [MINUS] ITEM MEASURE
```

Figure 25. Category probability curves of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 4 and 5

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1      752  45| -4.19 -4.17|  1.06  1.08||  NONE   |( -4.48)| 1
|  2   2      568  34| -1.91 -1.94|   .88   .86||  -3.36  |  -1.74 | 2
|  3   3      306  18|   .44   .45|  1.04  1.04||   -.12  |   1.68 | 3
|  5   4       63   4|  2.14  2.18|  1.07  1.06||   3.47  |(  4.59)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      155   8| -1.78      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 26. Category structure of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                             +
O      |                                                             |
B      |                                                             |
A      |1                                                            |
B   .8 + 11                                                        55+
I      |   1                                  333333            55   |
L      |    11          22222222           333      33          5    |
I      |      1       22        22        3           33       5     |
T   .6 +       1     2            2     33              3    55      +
Y      |        11 22              22  3                 33 5        |
    .5 +          *                  23                    *         +
O      |         2 1                332                   5 3        |
F   .4 +       22   1              3   22                5   3       +
       |      2      1            3      2             55     33     |
R      |     2        11         3        2           5         3    |
E      |   22           1      33          22       55           33  |
S   .2 + 22              11  33              2     5               33+
P      |2                  **                 22255                  |
O      |                 33  111              55522                  |
N      |           333333       11111   555555     222222            |
S   .0 +***********555555555555555555***11111111111111111************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 27. Category probability curves of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
ITEM STATISTICS:  MISFIT ORDER

-------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT  MATCH|     |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM |
|------------------------------------+----------+----------+-----------+-----------+------|
|   110    370    232    1.15    .16|1.38   3.1|1.26   1.5|A .76   .81| 75.0  71.6| Q110 |
|   104    537    253   -1.19    .13|1.02    .2|1.02    .2|B .84   .85| 69.1  63.9| Q104 |
|   111    478    247    -.39    .14|1.00    .0|1.01    .2|C .85   .85| 66.7  67.1| Q111 |
|   106    449    242    -.17    .14| .97   -.2| .96   -.3|D .84   .84| 73.2  68.0| Q106 |
|   113    423    239     .29    .15| .97   -.2| .93   -.5|c .84   .83| 74.2  69.7| Q113 |
|   114    423    235     .16    .15| .88  -1.1| .89   -.9|b .86   .83| 71.1  69.2| Q114 |
|   115    441    241     .14    .14| .83  -1.7| .83  -1.5|a .86   .84| 75.1  69.1| Q115 |
|------------------------------------+----------+----------+-----------+-----------+------|
| MEAN   445.9  241.3     .00    .14|1.01    .0| .99   -.2|           | 72.1  68.4|      |
| S.D.    48.1    6.6     .66    .01| .17   1.4| .13    .9|           |  3.0   2.2|      |
-------------------------------------------------------------------------------------------
```

Figure 28. Item statistics of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

    110  Q110                       1.15     1.4   A    1.3
  RESPONSE:      1:   M   2   M   1   1    1   1   1   2   3
Z-RESIDUAL:               2           X    X       X

  RESPONSE:     11:   M   1   1   1   M    1   1   M   3   1
Z-RESIDUAL:               X  -2   X        X   X

  RESPONSE:     21:   1   M   1   3   1    1   1   1   1   1
Z-RESIDUAL:                       2           -2   X       X

  RESPONSE:     31:   3   M   M   1   2    1   1   2   1   2
Z-RESIDUAL:                      -3   2    X

  RESPONSE:     41:   1   2   M   1   M    1   2   3   M   1
Z-RESIDUAL:                               -2

  RESPONSE:     51:   1   1   2   1   1    1   1   1   1   1
Z-RESIDUAL:               X       X   X       -3       X

  RESPONSE:     61:   M   1   M   5   2    5   1   1   2   2
Z-RESIDUAL:                       2        X   X   X

  RESPONSE:     71:   1   M   1   3   2    2   3   2   1   1
Z-RESIDUAL:

  RESPONSE:     81:   3   1   M   M   2    2   M   3   1   2
Z-RESIDUAL:                                2

  RESPONSE:     91:   2   1   1   1   1    1   5   2   1   1
Z-RESIDUAL:                                    X           X
```


The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
  RESPONSE:    101:   1   1   2   3   2    1   1   1   M   2
Z-RESIDUAL:                       2                X

  RESPONSE:    111:   2   3   1   2   1    1   M   1   1   1
Z-RESIDUAL:                           X

  RESPONSE:    121:   1   1   1   M   M    1   1   M   M   M
Z-RESIDUAL:           X                        X

  RESPONSE:    131:   1   1   M   1   3    3   1   1   1   2
Z-RESIDUAL:           X   X       X

  RESPONSE:    141:   1   1   1   1   2    1   1   1   2   1
Z-RESIDUAL:                   X                        4

  RESPONSE:    151:   1   M   2   2   1    1   1   2   2   3
Z-RESIDUAL:                               -2   X

  RESPONSE:    161:   1   3   1   2   5    2   2   2   3   M
Z-RESIDUAL:                           2

  RESPONSE:    171:   2   3   2   1   1    M   2   1   M   1
Z-RESIDUAL:                           X            X

  RESPONSE:    181:   2   1   M   1   M    1   1   2   2   1
Z-RESIDUAL:               X       X        X   X

  RESPONSE:    191:   1   1   2   1   1    2   M   5   1   M
Z-RESIDUAL:                           X            X

  RESPONSE:    201:   2   1   1   3   1    3   1   2   2   2
Z-RESIDUAL:               X   X   2   X        X

  RESPONSE:    211:   1   3   1   3   1    3   1   1   3   2
Z-RESIDUAL:           X       X      -2            X   2

  RESPONSE:    221:   1   2   1   3   3    1   3   3   2   1
Z-RESIDUAL:                                                X

  RESPONSE:    231:   3   2   M   2   1    1   1   1   1   1
Z-RESIDUAL:           2                    X   X

  RESPONSE:    241:   1   2   M   2   1    1   1   M   1   1
Z-RESIDUAL:

  RESPONSE:    251:   1   2   1   M   2    1   2   1   M   M
Z-RESIDUAL:

  RESPONSE:    261:   1   M   M   1   1    1   1   3   1   3
Z-RESIDUAL:                                X

  RESPONSE:    271:   1   1   2   M
Z-RESIDUAL:           X
```

Figure 29. Person responses of item Q110

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
110	366	229	1.11	.16	1.20	1.8	1.01	.1	A .79	.81	75.7	71.8	Q110
104	537	253	-1.22	.13	1.05	.6	1.05	.6	B .84	.85	68.5	64.9	Q104
111	478	247	-.39	.14	1.02	.2	1.03	.3	C .85	.85	67.5	67.7	Q111
106	449	242	-.16	.14	1.01	.2	1.01	.1	D .84	.85	72.5	68.4	Q106
113	423	239	.31	.15	.98	-.2	.94	-.5	c .85	.84	74.6	70.0	Q113
114	423	235	.18	.15	.88	-1.1	.90	-.8	b .86	.84	71.5	69.5	Q114
115	441	241	.16	.15	.86	-1.4	.86	-1.2	a .86	.85	74.5	69.5	Q115
MEAN	445.3	240.9	.00	.15	1.00	.0	.97	-.2			72.1	68.8	
S.D.	49.0	7.2	.66	.01	.11	1.0	.07	.6			2.9	2.0	

Figure 30. Item statistics of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		Empirical			Modeled
Total raw variance in observations	=	18.7	100.0%		100.0%
Raw variance explained by measures	=	11.7	62.6%		62.5%
Raw variance explained by persons	=	10.7	57.3%		57.2%
Raw Variance explained by items	=	1.0	5.3%		5.3%
Raw unexplained variance (total)	=	7.0	37.4%	100.0%	37.5%
Unexplned variance in 1st contrast	=	1.8	9.7%	25.8%	
Unexplned variance in 2nd contrast	=	1.3	7.2%	19.1%	
Unexplned variance in 3rd contrast	=	1.1	6.0%	16.1%	
Unexplned variance in 4th contrast	=	1.0	5.3%	14.2%	
Unexplned variance in 5th contrast	=	.9	4.8%	12.8%	

Figure 31. Standardized residual variance of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
110	366	229	1.11	.16	1.20	1.8	1.01	.1	A .79	.79	75.7	71.8	Q110
104	537	253	-1.22	.13	1.05	.6	1.05	.6	B .78	.77	68.5	64.9	Q104
111	478	247	-.39	.14	1.02	.2	1.03	.3	C .79	.79	67.5	67.7	Q111
106	449	242	-.16	.14	1.01	.2	1.01	.1	D .75	.78	72.5	68.4	Q106
113	423	239	.31	.15	.98	-.2	.94	-.5	c .82	.82	74.6	70.0	Q113
114	423	235	.18	.15	.88	-1.1	.90	-.8	b .83	.81	71.5	69.5	Q114
115	441	241	.16	.15	.86	-1.4	.86	-1.2	a .78	.77	74.5	69.5	Q115
MEAN	445.3	240.9	.00	.15	1.00	.0	.97	-.2			72.1	68.8	
S.D.	49.0	7.2	.66	.01	.11	1.0	.07	.6			2.9	2.0	

Figure 32. Showing point-biserial correlations, item statistics of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	750	44	-4.32	-4.28	1.01	1.03	NONE	(-4.60)	1
2	2	567	34	-1.99	-2.03	.89	.84	-3.48	-1.83	2
3	3	306	18	.45	.45	1.05	1.05	-.18	1.74	3
5	4	63	4	2.45	2.62	1.15	1.13	3.66	(4.78)	5
MISSING		157	9	-1.79						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 33. Category structure of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                             +
O      |                                                             |
B      |                                                             |
A      |                                                             |
B   .8 +11                                                          5+
I      |  11                               333333333             55  |
L      |    1         222222222           3         33          5    |
I      |     1      22        22       33            33       5     |
T   .6 +      11    2            2     3                3    55      +
Y      |       1  2               2  33                  33 5        |
    .5 +        *2                 2*                      *         +
O      |       2 1                 3 2                    5 3        |
F   .4 +      2   1               3   2                  5   3       +
       |    22     11           33     2               55     33     |
R      |   2         1         3        22            5         3    |
E      |  22          1       3           2         55           33  |
S   .2 +22             11   33             22      5               3+
P      |                 1*3                 22  55                  |
O      |               333 111                5**2                   |
N      |          33333       11111     555555    222222             |
S   .0 +***********5555555555555555*****11111111111111***************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 34. Category probability curves of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	Welch d.f.	Welch Prob.	MantelHanzl Prob.	MantelHanzl Size	ITEM Number	Name
F	-1.08	.16	M	-1.61	.26	.53	.31	1.75	115	.0828	.0478	.67	104	Q104
F	-.14	.16	M	-.22	.29	.08	.33	.23	104	.8167	.8824	-.53	106	Q106
F	1.21	.18	M	.78	.32	.43	.37	1.14	93	.2554	.2024	-.61	110	Q110
F	-.42	.16	M	-.26	.30	-.16	.34	-.47	97	.6388	.7812	-.18	111	Q111
F	.27	.17	M	.47	.32	-.20	.36	-.57	93	.5733	.3131	-.61	113	Q113
F	.11	.17	M	.46	.32	-.35	.36	-.96	90	.3419	.5243	.61	114	Q114
F	.06	.17	M	.50	.30	-.44	.34	-1.29	100	.2015	.0927	-.44	115	Q115

Figure 35. Gender DIF of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 214 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	12.5	6.3	-2.03	.87	.95	-.2	.93	-.2
S.D.	5.4	1.6	2.28	.28	.83	1.3	.84	1.3
MAX.	27.0	7.0	4.25	2.09	4.74	3.6	4.68	3.5
MIN.	2.0	1.0	-5.43	.69	.00	-2.5	.00	-2.5

REAL RMSE 1.01 TRUE SD 2.05 SEPARATION 2.02 PERSON RELIABILITY .80
MODEL RMSE .92 TRUE SD 2.09 SEPARATION 2.27 PERSON RELIABILITY .84
S.E. OF PERSON MEAN = .16

MAXIMUM EXTREME SCORE: 4 PERSON
MINIMUM EXTREME SCORE: 47 PERSON
LACKING RESPONSES: 9 PERSON
VALID RESPONSES: 89.5% (APPROXIMATE)

SUMMARY OF 7 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	445.3	240.9	.00	.15	1.00	.0	.97	-.2
S.D.	49.0	7.2	.66	.01	.11	1.0	.07	.6
MAX.	537.0	253.0	1.11	.16	1.20	1.8	1.05	.6
MIN.	366.0	229.0	-1.22	.13	.86	-1.4	.86	-1.2

REAL RMSE .15 TRUE SD .64 SEPARATION 4.31 ITEM RELIABILITY .95
MODEL RMSE .15 TRUE SD .64 SEPARATION 4.40 ITEM RELIABILITY .95
S.E. OF ITEM MEAN = .27

Figure 36. Separations and reliabilities of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   5             #  +
                    |
                    |
                    |
                 .  |
   4                +
                    |
                 .  |
                 .  |
                    |
   3             .  +
                    |
                   T|
                 .  |
                    |
   2             .  +
               .##  |
                 .  |
                 .  |T
               .##  |  Q110
   1             .  +
                    |
               .##  |S
                    |  Q113
                 # S|  Q114   Q115
   0                +M
                    |  Q106
               .##  |  Q111
                 .  |S
                ##  |
  -1             .  +
                 .  |  Q104
              ####  |T
                 .  |
            .#####  |
  -2             . M+
                .#  |
               ###  |
                 .  |
               .##  |
  -3             #  +
                 .  |
              .###  |
                 .  |
               ###  |
  -4                +
                    |
                 . S|
              .###  |
                    |
  -5             .  +
                 .  |
           .######  |
                    |
                    |
  -6  .###########  +
              <less>|<frequ>
EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 37. Person-item map of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
              <more>|
    5              #  +
                      |                 Q110.45
                      |
                      |
                   .  |
    4                 +                 Q113.45
                                        Q114.45
                      |                 Q115.45
                   .  |                 Q106.45
                   .  |                 Q111.45
                      |
    3              .  +
                      |
                     T|                 Q104.45
                   .  |
                      |
    2              .  +
                 .##  |
                   .  |
                   .  |T
                 .##  |
    1              .  +         Q110.25
                      |
                 .##  |S
                      |
                   # S|         Q113.25
    0                 +M        Q114.25
                                Q115.25
                      |
                 .##  |         Q106.25
                   .  |S        Q111.25
                  ##  |
   -1              .  +
                   .  |
                ####  |T        Q104.25
                   .  |
              .#####  |
   -2              . M+
                  .#  |
                 ###  |  Q110.15
                   .  |
                 .##  |
   -3              #  +
                   .  |  Q113.15
                .###  |  Q114.15
                         Q115.15
                   .  |
                 ###  |  Q106.15
   -4                 +  Q111.15
                      |
                   . S|
                .###  |
                      |  Q104.15
   -5              .  +
                   .  |
             .######  |
                      |
   -6     .###########  +
              <less>|
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 38. Person-item map: Expected score zones (Rasch-half-point thresholds), of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
104	111	-0.3635
104	113	-0.344
106	113	-0.2902
106	111	-0.2738
110	111	-0.2665
104	114	-0.248
106	114	-0.243
110	113	-0.2283
104	115	-0.214
106	110	-0.168
106	115	-0.1647
111	115	-0.155
111	114	-0.1494
110	115	-0.1376
113	115	-0.123
113	114	-0.1144
104	110	-0.1056
114	115	-0.0849
110	114	-0.0309
104	106	0.0888
111	113	0.1731

Figure 39. Correlations of residuals for each item pair of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-6       -4        -2         0         2         4         6
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
1            1    :       2        :        3         :    55  110  Q110
|                                                           |
|                                                           |
1        1    :       2        :        3         :    5    5  113  Q113
1       1    :        2       :         3         :    5    5  114  Q114
1       1    :        2       :         3        :     5    5  115  Q115
1     1    :        2       :         3         :    5      5  106  Q106
1    1    :        2       :         3         :    5       5  111  Q111
|                                                           |
|                                                           |
11    :        2       :         3         :    5           5  104  Q104
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
-6       -4        -2         0         2         4         6

4  2   1   1 1    1  2 1    1    1
61 511 52  225149227112621810  4 0 191291 1  3 11  1         4  PERSON
 S              M              S             T
0 20  30    40 50   60 70  80      90                    99  PERCENTILE
```

Figure 40. Construct keymap of 7-item group 3 comprising items Q104, Q106, Q110, Q111, Q113, Q114, and Q115, after combining categories 3 and 4, and editing 3 odd person responses to item Q110

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	19.2	100.0%		100.0%
Raw variance explained by measures	=	14.2	73.9%		74.1%
Raw variance explained by persons	=	13.3	69.4%		69.5%
Raw Variance explained by items	=	.9	4.5%		4.5%
Raw unexplained variance (total)	=	5.0	26.1%	100.0%	25.9%
Unexplned variance in 1st contrast	=	1.6	8.4%	32.3%	
Unexplned variance in 2nd contrast	=	1.2	6.4%	24.5%	
Unexplned variance in 3rd contrast	=	1.2	6.3%	24.3%	
Unexplned variance in 4th contrast	=	.9	4.9%	18.9%	
Unexplned variance in 5th contrast	=	.0	.1%	.3%	

Figure 41. Standardized residual variance of 5-item group 4 comprising items Q103, Q105, Q107, Q109, and Q112

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	515	43	-5.93	-5.89	.97	.95	NONE	(-6.36)	1
2	2	436	36	-3.06	-3.06	.91	.87	-5.26	-3.00	2
3	3	158	13	-.34	-.45	.97	.95	-.73	.58	3
4	4	54	4	2.20	2.18	1.01	.96	1.96	3.02	4
5	5	46	4	4.35	4.63	1.74	1.93	4.04	(5.22)	5
MISSING		65	5	-2.68						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 42. Category structure of 5-item group 4 comprising items Q103, Q105, Q107, Q109, and Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                       55|
B      |                                                    555  |
A      |1              2                                  5     |
B   .8 + 11          222 222                              5      +
I      |   1        2      2                            5       |
L      |    1      2         2                         5        |
I      |    1     2           2     3333              5         |
T   .6 +     1   2             2   33    3      44    5          +
Y      |      1 2               2 3       3   44  4  5           |
    .5 +       *                 *         3 4     4*            +
O      |      2 1               32          *       54           |
F   .4 +     2  1               3 2        4 3     5 4           +
       |    2    1             3   2      4  3    5   4          |
R      |    2     1           3     2    4    3   5    4         |
E      |   2       1         3       2  4      3 5      44       |
S   .2 + 22         1       3         24        *         4      +
P      |2            11   33          42       5 3         4     |
O      |              1*3         44  22   55  33        444  |
N      |           3333 1111   444      ***       333        44|
S   .0 +**********************************111********************+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -7      -5      -3      -1       1       3       5       7
        PERSON [MINUS] ITEM MEASURE
```

Figure 43. Category probability curves of 5-item group 4 comprising items Q103, Q105, Q107, Q109, and Q112

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
112	403	237	1.18	.17	1.27	2.1	1.17	1.1	A .86	.87	71.3	73.9	Q112
103	503	246	-.77	.14	1.14	1.3	1.13	1.2	B .90	.91	70.2	66.9	Q103
109	452	239	-.04	.16	.96	-.3	.96	-.3	C .90	.90	71.4	71.5	Q109
107	499	244	-.68	.15	.91	-.8	.87	-1.1	b .91	.90	70.2	67.5	Q107
105	450	243	.31	.16	.76	-2.2	.70	-2.6	a .92	.89	80.4	72.3	Q105
MEAN	461.4	241.8	.00	.15	1.01	.0	.97	-.4			72.7	70.4	
S.D.	36.8	3.3	.71	.01	.18	1.5	.17	1.4			3.9	2.8	

Figure 44. Item statistics of 5-item group 4 comprising items Q103, Q105, Q107, Q109, and Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFIT

    112  Q112                       1.18     1.3   A    1.2
  RESPONSE:       1:  M   1   2   1   1    1   2   1   2   3
Z-RESIDUAL:                      -2   X    X   3   X

  RESPONSE:      11:  M   1   3   1   M    1   1   M   3   1
Z-RESIDUAL:               X       X        X   X

  RESPONSE:      21:  1   M   1   2   2    1   1   1   1   1
Z-RESIDUAL:                                  -2            X

  RESPONSE:      31:  2   M   3   5   2    1   1   M   2   M
Z-RESIDUAL:                                X  -2

  RESPONSE:      41:  2   2   2   1   M    3   4   2   M   1
Z-RESIDUAL:

  RESPONSE:      51:  1   1   2   1   1    1   3   1   1   1
Z-RESIDUAL:               X       X        X           X

  RESPONSE:      61:  M   1   M   3   2    5   1   1   2   2
Z-RESIDUAL:                                X   X   X

  RESPONSE:      71:  1   M   1   2   4    1   M   2   1   1
Z-RESIDUAL:

  RESPONSE:      81:  2   1   M   M   1    2   M   2   1   1
Z-RESIDUAL:          -2                                X  -2

  RESPONSE:      91:  1   1   1   1   1    1   5   3   1   1
Z-RESIDUAL:                   X   X   X        X       X   X

  RESPONSE:     101:  1   1   2   1   3    1   1   1   M   2
Z-RESIDUAL:                      -2   2        X   X
  RESPONSE:     111:  2   4   1   2   1    1   M   1   1   1
Z-RESIDUAL:                   X       X                X

  RESPONSE:     121:  1   1   1   M   2    1   1   M   M   M
Z-RESIDUAL:           X                        X

  RESPONSE:     131:  1   1   M   1   3    2   1   2   2   2
Z-RESIDUAL:           X   X       X            X

  RESPONSE:     141:  2   1   1   1   2    1   1   1   1   1
Z-RESIDUAL:               X   X   X            X  -2   X

  RESPONSE:     151:  1   1   1   2   1    5   1   2   2   4
Z-RESIDUAL:           X   X                3

  RESPONSE:     161:  1   2   1   3   4    4   2   2   1   M
Z-RESIDUAL:                       2                   -2

  RESPONSE:     171:  2   3   3   2   1    M   2   1   M   1
Z-RESIDUAL:                   2       X                X

  RESPONSE:     181:  2   1   M   1   M    1   1   2   2   1
Z-RESIDUAL:               X       X        X   X           X

  RESPONSE:     191:  1   1   2   1   1    2   M   5   1   2
Z-RESIDUAL:               X       X   X    2       X   X

  RESPONSE:     201:  2   1   1   2   1    4   1   2   2   3
Z-RESIDUAL:               X   X                X

  RESPONSE:     211:  1   M   1   4   2    5   1   1   1   2
Z-RESIDUAL:           X       X               -2

  RESPONSE:     221:  1   3   1   2   4    2   3   2   3   1
Z-RESIDUAL:               2   X       2                    X

  RESPONSE:     231:  2   2   2   2   1    1   1   3   1   1
Z-RESIDUAL:                                X       2

  RESPONSE:     241:  2   3   M   2   2    2   1   2   1   1
Z-RESIDUAL:                                   -2

  RESPONSE:     251:  3   2   1   M   3    1   2   1   M   M
Z-RESIDUAL:                           2

  RESPONSE:     261:  1   2   M   2   1    1   1   3   1   2
Z-RESIDUAL:                                X

  RESPONSE:     271:  1   1   2   M
Z-RESIDUAL:           X
```

Figure 45. Person responses of item Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
112	396	235	1.29	.17	1.18	1.4	1.05	.4	A .86	.87	72.1	74.0	Q112
103	503	246	-.81	.15	1.16	1.4	1.15	1.3	B .90	.91	68.9	67.2	Q103
109	452	239	-.06	.16	.98	-.1	.97	-.2	C .90	.90	71.3	71.9	Q109
107	499	244	-.72	.15	.92	-.7	.88	-1.0	b .91	.91	70.6	67.9	Q107
105	450	243	.30	.16	.77	-2.0	.71	-2.5	a .92	.90	80.3	72.7	Q105
MEAN	460.0	241.4	.00	.16	1.00	.0	.95	-.4			72.6	70.7	
S.D.	39.1	3.9	.76	.01	.15	1.3	.15	1.3			4.0	2.7	

Figure 46. Item statistics of 5-item group 4 comprising items Q103, Q105, Q107, Q109, and Q112 after editing 2 persons'' responses to item Q112

```
TABLE 11.1 04 Apr data.xls                    ZOU393WS.TXT  Jul 16 19:21 2018
INPUT: 274 PERSON  172 ITEM  REPORTED: 259 PERSON  5 ITEM  5 CATS WINSTEPS 3.71.0.1
--------------------------------------------------------------------------------

NO POORLY FITTING ITEM
```

Figure 47. Result of WINSTEPS after selecting 11. ITEM: responses

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.62	.17	M	-1.31	.28	.68	.33	2.07	101	.0406	.0821	.34	103	Q103
F	.32	.18	M	.23	.31	.09	.36	.24	98	.8084	.6069	-1.20	105	Q105
F	-.67	.17	M	-.83	.29	.16	.34	.48	95	.6346	.1576	.51	107	Q107
F	-.10	.18	M	.07	.32	-.16	.37	-.44	89	.6577	.3569	.86	109	Q109
F	1.03	.19	M	2.16	.36	-1.14	.41	-2.79	82	.0065	.0359	-.87	112	Q112

Figure 48. Gender DIF analysis of the 5-item group 4 comprising items Q103, Q105, Q107, Q109, and Q112 after editing 2 persons'' responses to item Q112

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.39	.18	M	-.90	.29	.51	.34	1.49	100	.1391	.0961	-.37	103	Q103
F	.64	.19	M	.79	.33	-.15	.38	-.40	95	.6892	.8023	-.	105	Q105
F	-.43	.18	M	-.39	.30	-.04	.35	-.12	93	.9052	.9244	.16	107	Q107
F	.19	.19	M	.60	.34	-.42	.39	-1.07	86	.2879	.0865	-.11	109	Q109

Figure 49. Gender DIF analysis of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
103	503	246	-.53	.15	1.14	1.3	1.08	.7	A .91	.91	71.9	69.1	Q103
109	452	239	.29	.17	1.09	.8	1.08	.6	B .90	.90	70.9	73.5	Q109
107	499	244	-.43	.15	.97	-.2	.92	-.6	b .91	.91	69.7	69.9	Q107
105	450	243	.67	.17	.77	-2.1	.68	-2.6	a .92	.90	81.8	74.5	Q105
MEAN	476.0	243.0	.00	.16	.99	.0	.94	-.5			73.6	71.7	
S.D.	25.0	2.5	.50	.01	.15	1.3	.16	1.3			4.8	2.3	

Figure 50. Item statistics of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	15.0	100.0%		100.0%
Raw variance explained by measures	=	11.0	73.3%		73.4%
Raw variance explained by persons	=	10.8	71.8%		71.8%
Raw Variance explained by items	=	.2	1.6%		1.6%
Raw unexplained variance (total)	=	4.0	26.7%	100.0%	26.6%
Unexplned variance in 1st contrast	=	1.7	11.3%	42.2%	
Unexplned variance in 2nd contrast	=	1.3	8.6%	32.3%	
Unexplned variance in 3rd contrast	=	1.0	6.8%	25.4%	
Unexplned variance in 4th contrast	=	.0	.0%	.1%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 51. Standardized residual variance of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
103	503	246	-.53	.15	1.14	1.3	1.08	.7	A .89	.89	71.9	69.1	Q103
109	452	239	.29	.17	1.09	.8	1.08	.6	B .89	.90	70.9	73.5	Q109
107	499	244	-.43	.15	.97	-.2	.92	-.6	b .86	.88	69.7	69.9	Q107
105	450	243	.67	.17	.77	-2.1	.68	-2.6	a .93	.90	81.8	74.5	Q105
MEAN	476.0	243.0	.00	.16	.99	.0	.94	-.5			73.6	71.7	
S.D.	25.0	2.5	.50	.01	.15	1.3	.16	1.3			4.8	2.3	

Figure 52. Item statistics of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     386  40| -6.63 -6.57|   .93   .87||  NONE   |( -7.24)| 1
|  2   2     365  38| -3.34 -3.36|   .94   .92||   -6.14 |  -3.40 | 2
|  3   3     136  14|  -.11  -.14|   .97   .89||    -.66 |    .79 | 3
|  4   4      45   5|  2.59  2.48|   .97  1.00||    2.28 |   3.42 | 4
|  5   5      40   4|  4.25  4.63|  1.67  1.76||    4.52 |(  5.70)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      44   4| -2.69      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 53. Category structure of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                 2222                                    |
A      |11             22    22                                  |
B   .8 +  1          22        22                               5+
I      |   1        2            2                             5 |
L      |    1      2              2        33                 5  |
I      |     1    2                2     33  33              5   |
T   .6 +      1  2                 2    3      3    4444    5    +
Y      |       12                   2  3        3  4    44 5     |
    .5 +       *                     23         3 4       *      +
O      |       21                    32          *        54     |
F   .4 +      2  1                  3  2        4 3      5 4     +
       |     2    1                3   2       4   3    5   4    |
R      |    2      1              3     2     4     3  5     4   |
E      |   2        1            3       2   4       3 5      44 |
S   .2 +  2          1          3         2 4         *         4+
P      |22            11        33           *2       55 3       |
O      |                11  33           44  2     5    3        |
N      |                33**11        444     22**5      333     |
S   .0 +****************************************11***************+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -8      -6      -4      -2       0       2       4       6
        PERSON [MINUS] ITEM MEASURE
```

Figure 54. Category probability curves of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     SUMMARY OF 187 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE      COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN       8.3        3.8       -2.79    1.21        .92    -.2    .91    -.2 |
| S.D.       3.3         .7        3.19     .43       1.13    1.2   1.14    1.2 |
| MAX.      19.0        4.0        5.77    2.95       7.91    4.8   7.94    4.6 |
| MIN.       2.0        1.0       -7.30     .79        .00   -2.3    .00   -2.3 |
|-----------------------------------------------------------------------------|
| REAL RMSE    1.43 TRUE SD    2.85  SEPARATION  1.99  PERSON RELIABILITY  .80 |
|MODEL RMSE    1.28 TRUE SD    2.92  SEPARATION  2.28  PERSON RELIABILITY  .84 |
| S.E. OF PERSON MEAN = .23                                                   |
-------------------------------------------------------------------------------
  MAXIMUM EXTREME SCORE:      6 PERSON
  MINIMUM EXTREME SCORE:     65 PERSON
      LACKING RESPONSES:     16 PERSON
     SUMMARY OF 4 MEASURED (NON-EXTREME) ITEM
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE      COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     476.0      243.0         .00     .16        .99     .0    .94    -.5 |
| S.D.      25.0        2.5         .50     .01        .15    1.3    .16    1.3 |
| MAX.     503.0      246.0         .67     .17       1.14    1.3   1.08     .7 |
| MIN.     450.0      239.0        -.53     .15        .77   -2.1    .68   -2.6 |
|-----------------------------------------------------------------------------|
| REAL RMSE     .16 TRUE SD     .47  SEPARATION  2.87  ITEM   RELIABILITY  .89 |
|MODEL RMSE     .16 TRUE SD     .47  SEPARATION  2.97  ITEM   RELIABILITY  .90 |
| S.E. OF ITEM MEAN = .29                                                     |
-------------------------------------------------------------------------------
```

Figure 55. Separations and reliabilities of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   6            .#  +
                 .  |
                 .  |
                    |
   5                +
                    |
                 .  |
                    |
   4             .  +
                    |
                 # T|
                    |
   3                +
                 .  |
                    |
                 .  |
   2                +
                 .  |
                 #  |
                    |
   1             .  +T
                ##  |  Q105
                   S|S
                    |  Q105
   0            .#  +M
                    |
                    |S Q103   Q107
              .###  |
  -1                +T
                 .  |
                    |
             .####  |
  -2                +
                    |
                    |
                 . M|
  -3             .  +
                    |
          .#######  |
                 .  |
  -4             .  +
                    |
                    |
                    |
  -5           .##  +
                    |
                    |
                    |
  -6             . S+
              .###  |
                    |
                 .  |
  -7             .  +
            .#####  |
                    |
                    |
  -8 #############  +
              <less>|<frequ>
EACH "#" IS 5. EACH "." IS 1 TO 4
```

Figure 56. Person-item map of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
                  <more>|
   6               .#   +
                    .   |
                    .   |                        Q105.45
                        |
   5                    +                        Q109.45
                        |
                    .   |
                        |                        Q103.45
                                                 Q107.45
   4                .   +
                        |
                    # T |
                        |
   3                    +
                    .   |                 Q105.35
                        |                 Q109.35
                    .   |
   2                    +
                    .   |                 Q103.35
                                          Q107.35
                    #   |
                        |
   1                .   +T
                   ##   |
                      S |S
                        |
   0               .#   +M         Q105.25
                        |
                        |S         Q109.25
                 .###   |
  -1                    +T
                    .   |          Q103.25
                                   Q107.25
                        |
               .####    |
  -2                    +
                        |
                        |
                    . M |
  -3                .   +
                        |
             .#######   |
                    .   |
  -4                .   +
                        |
                        |
                        |
  -5              .##   +
                        |
                        |   Q105.15
                        |   Q109.15
  -6                . S +
                 .###   |
                        |   Q107.15
                    .   |   Q103.15
  -7                .   +
               .#####   |
                        |
                        |
  -8 #############      +
                  <less>|
 EACH "#" IS 5. EACH "." IS 1 TO 4
```

Figure 57. Person-item map: Expected score zones (Rasch-half-point thresholds), of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
103	109	-0.548
103	107	-0.433
105	107	-0.405
105	109	-0.2615
107	109	-0.196
103	105	-0.1206

Figure 58. Correlations of residuals for each item pair of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-8     -6     -4     -2      0      2      4      6      8
|------+------+------+------+------+------+------+------| NUM   ITEM
1    1   :        2         :    3    :   4    :  5     5 105  Q105
|                                                       |
1   1  :         2        :     3    :   4    :  5      5 109  Q109
|                                                       |
|                                                       |
11   :         2        :    3    :   4    :  5         5 107  Q107
11   :        2        :     3    :   4    :  5         5 103  Q103
|------+------+------+------+------+------+------+------| NUM   ITEM
-8     -6     -4     -2      0      2      4      6      8

6 2   1   1     3     2  1     1
1 7 2271  3   33931   2 18  6  1 54 1 1 5 2 1  13    5    PERSON
S             M             S             T
0 30 40       50 60  70 80     90                  99     PERCENTILE
```

Figure 59. Construct keymap of the 4-item group 4 comprising items Q103, Q105, Q107, and Q109, after removing item Q112

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 23: Homesickness's work-in-progress figures and tables

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --		Modeled
Total raw variance in observations =	30.7	100.0%		100.0%
Raw variance explained by measures =	16.7	54.3%		54.4%
Raw variance explained by persons =	14.5	47.4%		47.5%
Raw Variance explained by items =	2.1	6.9%		6.9%
Raw unexplained variance (total) =	14.0	45.7%	100.0%	45.6%
Unexplned variance in 1st contrast =	3.4	11.2%	24.6%	
Unexplned variance in 2nd contrast =	1.8	5.9%	12.9%	
Unexplned variance in 3rd contrast =	1.2	4.0%	8.8%	
Unexplned variance in 4th contrast =	1.1	3.7%	8.1%	
Unexplned variance in 5th contrast =	1.1	3.5%	7.7%	

Figure 1. Standardized residual variance of initial Homesickness dimension

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM
1	.70	-.35	1.07	1.08	A 131	Q131	-.62	.31	.68	.65	a 121	Q121
1	.69	-.62	1.00	1.10	B 132	Q132	-.60	-.06	.72	.71	b 124	Q124
1	.65	-.92	1.25	1.38	C 134	Q134	-.59	-.22	.55	.55	c 125	Q125
1	.36	-.07	.88	.89	D 133	Q133	-.47	.41	.67	.67	d 128	Q128
1	.18	.56	1.36	1.28	E 129	Q129	-.47	-.02	1.19	1.23	e 123	Q123
1	.17	.58	1.65	1.69	F 130	Q130	-.43	.19	.84	.83	f 122	Q122
							-.30	-.21	.79	.83	g 126	Q126
							-.22	.41	1.72	1.52	G 127	Q127

Figure 2. Residual loadings for items in the first contrast of initial Homesickness dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        STANDARDIZED RESIDUAL CONTRAST 1 PLOT

       -1                                0                                1
       -+--------------------------------+--------------------------------+- COUNT
    .7 +           B        A            |                                + 2
       |   C                             |                                | 1
    .6 +                                 |                                +
       |                                 |                                |
    .5 +                                 |                                +
 C     |                                 |                                |
 O  .4 +                                 |                                +
 N     |                               D |                                | 1
 T  .3 +                                 |                                +
 R     |                                 |                                |
 A  .2 +                                 |                 E              + 1
 S     |                                 |                  F             | 1
 T  .1 +                                 |                                +
       |                                 |                                |
 1  .0 +---------------------------------|--------------------------------+
       |                                 |                                |
 L -.1 +                                 |                                +
 O     |                                 |                                |
 A -.2 +                                 |            G                   + 1
 D     |                                 |                                |
 I -.3 +                          g      |                                + 1
 N     |                                 |                                |
 G -.4 +                                 |                                +
       |                                e|      f       d                 | 3
   -.5 +                                 |                                +
       |                                 |                                |
   -.6 +                          c    b |          a                     + 3
       |                                 |                                |
       -+--------------------------------+--------------------------------+-
       -1                                0                                1
                                   ITEM MEASURE
 COUNT:    1        1         1   2    21      1   1  11   11
```

Figure 3. The principal component analysis plot of item loading for the first contrast of the initial Homesickness dimension

```
     SUMMARY OF 2 MEASURED (NON-EXTREME) ITEM
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE      COUNT    MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     487.0      249.0        .00     .15       .99     .0    .95    -.3 |
| S.D.      10.0        3.0        .05     .00       .01     .1    .01     .1 |
| MAX.     497.0      252.0        .05     .15      1.00     .1    .96    -.2 |
| MIN.     477.0      246.0       -.05     .15       .98    -.1    .94    -.4 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .15 TRUE SD      .00  SEPARATION   .00  ITEM   RELIABILITY  .00 |
|MODEL RMSE    .15 TRUE SD      .00  SEPARATION   .00  ITEM   RELIABILITY  .00 |
| S.E. OF ITEM MEAN = .05                                                     |
-------------------------------------------------------------------------------
```

Figure 4. Item separation and reliability of group 1 comprising 2 items—Q129 and Q130

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     SUMMARY OF 197 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN       4.1       1.7      -1.65    1.38        .84    -.5    .84    -.5 |
| S.D.       1.6        .4       1.99     .24       1.48    1.3   1.48    1.3 |
| MAX.       9.0       2.0       3.87    1.85       8.47    3.3   8.49    3.3 |
| MIN.       2.0       1.0      -4.34    1.05        .00   -2.1    .00   -2.1 |
|-----------------------------------------------------------------------------|
| REAL RMSE   1.62 TRUE SD    1.16  SEPARATION   .72  PERSON RELIABILITY  .34 |
|MODEL RMSE   1.40 TRUE SD    1.42  SEPARATION  1.01  PERSON RELIABILITY  .51 |
| S.E. OF PERSON MEAN = .14                                                   |
-------------------------------------------------------------------------------
  MAXIMUM EXTREME SCORE:      14 PERSON
  MINIMUM EXTREME SCORE:      56 PERSON
      LACKING RESPONSES:       7 PERSON
```

Figure 5. Person separation and reliability of group 2 comprising 2 items—Q126 and Q127

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                -- Empirical --    Modeled
Total raw variance in observations     =         13.7 100.0%         100.0%
  Raw variance explained by measures   =          9.7  70.8%          70.5%
    Raw variance explained by persons  =          7.8  56.8%          56.6%
    Raw Variance explained by items    =          1.9  14.0%          13.9%
  Raw unexplained variance (total)     =          4.0  29.2% 100.0%   29.5%
    Unexplned variance in 1st contrast =          1.6  11.8%  40.3%
    Unexplned variance in 2nd contrast =          1.3   9.6%  32.7%
    Unexplned variance in 3rd contrast =          1.1   7.9%  27.0%
    Unexplned variance in 4th contrast =           .0    .0%    .1%
    Unexplned variance in 5th contrast =           .0    .0%    .0%
```

Figure 6. Standardized residual variance of group 3 comprising 4 items—Q131 to Q134

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL  SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1      269  25| -3.75 -3.90|  1.33  1.27||  NONE   |( -5.10)| 1
|  2   2      320  30| -2.46 -2.33|   .77   .83||   -3.95 |  -2.58 | 2
|  3   3      242  23|  -.42  -.50|   .80   .80||   -1.16 |   -.01 | 3
|  4   4      138  13|  1.83  1.76|   .98   .98||    1.15 |   2.58 | 4
|  5   5       97   9|  3.78  3.87|  1.33  1.28||    3.97 |(  5.11)| 5
|-------------------+------------+------------++---------+--------|
|MISSING       18   2| -1.24      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 7. Category structure of group 3 comprising 4 items—Q131 to Q134

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                             |
B      |1                                                           5|
A      | 11                                                       55 |
B   .8 +   1                                                     5   +
I      |    11                                                 55    |
L      |      1                                               5      |
I      |       1       222222                   4444444      5       |
T   .6 +        1    22      2      33333      4       4    5        +
Y      |         1  2         2   33     33   4         4  5         |
    .5 +          12           2 3         344           4*          +
O      |         221            *          43            5 4         |
F   .4 +        2   1          3 2        4  3          5   4        +
       |       2     1        3   2      4    3        5     4       |
R      |      2       1      3     22   4      3      5       4      |
E      |     2         1   33        2 4        33   5         4     |
S   .2 +   22           1 3           *           3 5           44   +
P      | 22             3*1         44 2          5*3             44 |
O      |2             33   11     44    22      55   33             4|
N      |          3333       11**4        22**55       3333          |
S   .0 +***********************55***********11***********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 8. Category probability curves of group 3 comprising 4 items—Q131 to Q134

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
134	730	265	-.83	.11	1.16	1.6	1.14	1.5	A .89	.90	70.0	59.6	Q134
133	587	258	.76	.12	1.15	1.5	1.15	1.5	B .87	.89	65.0	59.8	Q133
131	655	271	.31	.11	.95	-.6	.94	-.6	b .90	.89	66.8	60.8	Q131
132	700	272	-.24	.11	.72	-3.3	.73	-3.2	a .92	.89	73.0	60.7	Q132
MEAN	668.0	266.5	.00	.11	.99	-.2	.99	-.2			68.7	60.2	
S.D.	53.8	5.6	.59	.00	.18	2.0	.17	1.9			3.1	.5	

Figure 9. Item statistics of group 3 comprising 4 items—Q131 to Q134

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   6         .####  +
                    |
                    |
                    |
                .#  |
   5                +
                    |
                    |
                    |
                .#  |
   4                +
                   T|
                    |
               .##  |
                    |
   3                +
                    |
             .####  |
                    |
                    |
   2                +
                ##  |
                    |
                   S|
               .##  |T
   1                +
                    |  Q133
              .###  |S
                    |  Q131
                    |
   0       #######  +M
                 .  |  Q132
                    |
           #######  |S
                    |  Q134
  -1             .  +
           .###### M|T
                    |
                    |
            .#####  |
  -2                +
                    |
                    |
     #############  |
                 .  |
  -3                +
                    |
         .########  |
                   S|
                    |
  -4                +
              ####  |
                    |
                    |
                    |
  -5                +
             .####  |
                    |
                    |
                    |
  -6   ########### T+
              <less>|<frequ>
EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 10. Person-item map of group 3 comprising 4 items—Q131 to Q134

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	.20	.13	M	.70	.24	-.49	.27	-1.80	110	.0740	.1943	-.33	131	Q131
F	-.31	.13	M	.02	.24	-.33	.27	-1.24	111	.2185	.0868	.04	132	Q132
F	.76	.13	M	.76	.25	.00	.28	.00	104	1.000	.9844	.05	133	Q133
F	-.65	.13	M	-1.46	.24	.81	.27	3.01	106	.0033	.0144	.43	134	Q134

Figure 11. Gender DIF of group 3 comprising 4 items—Q131 to Q134

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.01	.14	M	.27	.27	-.28	.30	-.91	101	.3627	.6419	.33	131	Q131
F	-.64	.14	M	-.59	.27	-.05	.30	-.17	101	.8683	.8341	.17	132	Q132
F	.68	.15	M	.31	.28	.37	.32	1.17	95	.2442	.5616	.62	133	Q133

Figure 12. Gender DIF of revised group 3 comprising 3 items—Q131 to Q133.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
133	587	258	.59	.13	1.27	2.6	1.25	2.4	A .89	.91	65.8	64.1	Q133
131	655	271	.05	.13	.95	-.5	.92	-.8	B .92	.92	70.1	65.9	Q131
132	700	272	-.64	.12	.75	-2.7	.74	-2.9	a .94	.92	76.2	64.3	Q132
MEAN	647.3	267.0	.00	.13	.99	-.2	.97	-.4			70.7	64.8	
S.D.	46.4	6.4	.51	.00	.21	2.2	.21	2.2			4.2	.8	

Figure 13. Item statistics of revised group 3 comprising 3 items—Q131 to Q133

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	215	27	-4.28	-4.53	1.40	1.31	NONE	(-5.98)	1
2	2	250	31	-3.05	-2.87	.75	.79	-4.85	-3.17	2
3	3	179	22	-.54	-.65	.82	.80	-1.47	-.03	3
4	4	95	12	2.43	2.34	.94	.92	1.42	3.17	4
5	5	62	8	4.31	4.53	1.31	1.24	4.91	(6.03)	5
MISSING		12	1	-1.93						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 14. Category structure of revised group 3 comprising 3 items—Q131 to Q133

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
      CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                      555|
B      |                                                    55   |
A      |                                                  55     |
B   .8 +                                                 5       +
I      |1          22                          444      5        |
L      | 1       22  22        3             44   44   5         |
I      |  1     2      2     33 33          4       4 5          |
T   .6 +   1   2        2   33     3       4         4 5         +
Y      |    1 2          2 3        3  4              45         |
    .5 +     12           *          34               45         +
O      |     21           *          43               54         |
F   .4 +   2  1          3 2        4  3             5  4        +
       |  2    1        3   2      4    3           5    4       |
R      | 2      1      3     2     4     3         5      4      |
E      |2        1    3       2   4       3        5       4     |
S   .2 +          1  3         2 4         3  55            4    +
P      |           13          4*           35               44  |
O      |          3311        4  22        5533                44|
N      |      3333    111 4444     222  555    3333             444|
S   .0 +*********************************************************+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -6      -4      -2       0       2       4       6       8
        PERSON [MINUS] ITEM MEASURE
```

Figure 15. Category probability curves of revised group 3 comprising 3 items—Q131 to Q133

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	10.7	100.0%		100.0%
Raw variance explained by measures	=	7.7	72.0%		71.6%
Raw variance explained by persons	=	6.6	61.4%		61.1%
Raw Variance explained by items	=	1.1	10.5%		10.5%
Raw unexplained variance (total)	=	3.0	28.0%	100.0%	28.4%
Unexplned variance in 1st contrast	=	1.7	15.8%	56.3%	
Unexplned variance in 2nd contrast	=	1.3	12.2%	43.6%	
Unexplned variance in 3rd contrast	=	.0	.0%	.1%	
Unexplned variance in 4th contrast	=	.0	.0%	.0%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 15. Standardized residual variance of revised group 3 comprising 3 items—Q131 to Q133

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
133	587	258	.59	.13	1.27	2.6	1.25	2.4	A .89	.91	65.8	64.1	Q133
131	655	271	.05	.13	.95	-.5	.92	-.8	B .91	.90	70.1	65.9	Q131
132	700	272	-.64	.12	.75	-2.7	.74	-2.9	a .92	.90	76.2	64.3	Q132
MEAN	647.3	267.0	.00	.13	.99	-.2	.97	-.4			70.7	64.8	
S.D.	46.4	6.4	.51	.00	.21	2.2	.21	2.2			4.2	.8	

Figure 16. Item statistics of revised group 3 comprising 3 items—Q131 to Q133, showing

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

point biserial correlations

SUMMARY OF 214 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	7.6	2.9	-1.40	1.08	.95	-.3	.95	-.3
S.D.	2.6	.2	2.76	.08	1.29	1.4	1.29	1.4
MAX.	14.0	3.0	5.69	1.37	9.90	4.7	9.68	4.5
MIN.	4.0	2.0	-5.63	1.00	.03	-1.7	.03	-1.7

REAL RMSE 1.29 TRUE SD 2.45 SEPARATION 1.90 PERSON RELIABILITY .78
MODEL RMSE 1.08 TRUE SD 2.54 SEPARATION 2.34 PERSON RELIABILITY .85
S.E. OF PERSON MEAN = .19

MAXIMUM EXTREME SCORE: 13 PERSON
MINIMUM EXTREME SCORE: 45 PERSON
LACKING RESPONSES: 2 PERSON

SUMMARY OF 3 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	647.3	267.0	.00	.13	.99	-.2	.97	-.4
S.D.	46.4	6.4	.51	.00	.21	2.2	.21	2.2
MAX.	700.0	272.0	.59	.13	1.27	2.6	1.25	2.4
MIN.	587.0	258.0	-.64	.12	.75	-2.7	.74	-2.9

REAL RMSE .13 TRUE SD .49 SEPARATION 3.67 ITEM RELIABILITY .93
MODEL RMSE .13 TRUE SD .49 SEPARATION 3.85 ITEM RELIABILITY .94
S.E. OF ITEM MEAN = .36

DELETED: 1 ITEM

Figure 17. Separations and reliabilities of revised group 3 comprising 3 items—Q131 to Q133

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
                PERSON - MAP - ITEM
                    <more>|<rare>
    6                .###  +
                           |
                        #  |
                           |
                           |
    5                      +
                           |
                        .  |
                       .#  |
                          T|
    4                      +
                           |
                           |
                           |
                     ####  |
    3                      +
                        .  |
                           |
                           |
                           |
    2                  ##  +
                           |
                           |
                          S|
                           |
    1                  .#  +T
                           |
                           |S Q133
                           |
                           |
    0             #######  +M Q131
                           |
                        .  |
                           |S Q132
                           |
   -1             .######  +T
                           |
                          M|
                           |
                        .  |
   -2              .#####  +
                           |
                           |
                           |
                           |
   -3                      +
        .############      |
                       .#  |
                           |
                           |
   -4                      +
                          S|
                   .#####  |
                           |
                           |
   -5                      +
                           |
                           |
                     .###  |
                           |
   -6    .###########      +
                    <less>|<frequ>
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 18. Person-item map of revised group 3 comprising 3 items—Q131 to Q133

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    6          .###  +
                     |
                  #  |                            Q133.45
                     |
                     |
    5                +                            Q131.45
                     |
                  .  |
                 .#  |                            Q132.45
                    T|
    4                +
                     |
                     |
                     |
               ####  |
    3                +
                  .  |
                     |
                     |
                     |
    2            ##  +                   Q133.35
                     |
                     |                   Q131.35
                    S|
                     |
    1            .#  +T
                     |                   Q132.35
                     |S
                     |
                     |
    0       #######  +M
                     |
                  .  |
                     |S
                     |
   -1       .######  +T         Q133.25
                     |
                    M|          Q131.25
                     |
                  .  |
   -2        .#####  +
                     |          Q132.25
                     |
                     |
                     |
   -3                +
      .############  |
                 .#  |
                     |
                     |
   -4                +
                    S|
             .#####  |  Q133.15
                     |
                     |  Q131.15
   -5                +
                     |
                     |
               .###  |  Q132.15
                     |
   -6  .###########  +
               <less>|
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 19. Person-item map: Expected score zones (Rasch-half-point thresholds), of revised group 3 comprising 3 items—Q131 to Q133

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
131	133	-0.633
132	133	-0.5319
131	132	-0.3155

Figure 20. Correlations of residuals for each item pair of revised group 3 comprising 3 items—Q131 to Q133

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-7      -5      -3      -1       1       3       5       7
|-------+-------+-------+-------+-------+-------+-------|  NUM   ITEM
1     1    :      2     :     3     :      4      :    55  133  Q133
|                                                       |
1   1   :      2      :     3     :      4      :   5   5  131  Q131
|                                                       |
1 1   :      2     :     3     :      4      :    5     5  132  Q132
|-------+-------+-------+-------+-------+-------+-------|  NUM   ITEM
-7      -5      -3      -1       1       3       5       7

4    1     2   4    2   2   2            1              1
4  1 5     2  69    11  6  38   7   8  1 6  61     4  1 2  PERSON
     S              M               S              T
0 10 20   30  50        60  70  80       90            99  PERCENTILE
```

Figure 21. Construct keymap of revised group 3 comprising 3 items—Q131 to Q133

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
123	585	259	-.22	.12	1.52	4.4	1.54	4.5	A .83	.87	59.2	62.9	Q123
122	562	261	.16	.12	1.26	2.3	1.28	2.5	B .84	.86	72.2	64.1	Q122
124	593	261	-.32	.12	.90	-1.0	.95	-.5	C .89	.88	69.2	63.0	Q124
128	531	259	.59	.12	.89	-1.1	.86	-1.3	c .86	.85	70.5	64.9	Q128
121	539	257	.41	.12	.73	-2.8	.67	-3.4	b .89	.86	77.0	64.9	Q121
125	622	265	-.62	.12	.65	-4.0	.68	-3.6	a .91	.88	75.2	61.6	Q125
MEAN	572.0	260.3	.00	.12	.99	-.4	.99	-.3			70.6	63.6	
S.D.	31.6	2.5	.42	.00	.30	2.9	.32	2.9			5.7	1.2	

Figure 22. Item statistics of group 4 comprising 6 items—Q121 to Q125, and Q128

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
122	562	261	.15	.13	1.39	3.4	1.37	3.0	A .86	.89	73.3	67.3	Q122
124	593	261	-.45	.13	.99	.0	1.02	.3	B .90	.90	72.2	65.7	Q124
128	531	259	.67	.14	.98	-.1	.96	-.3	C .88	.88	69.3	68.5	Q128
121	539	257	.44	.14	.79	-2.1	.74	-2.5	b .91	.89	80.8	68.3	Q121
125	622	265	-.81	.13	.77	-2.5	.79	-2.1	a .92	.90	76.0	65.5	Q125
MEAN	569.4	260.6	.00	.13	.99	-.3	.98	-.3			74.3	67.1	
S.D.	34.0	2.7	.55	.00	.22	2.1	.22	2.0			3.9	1.3	

Figure 23. Item statistics of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
TABLE OF POORLY FITTING ITEM   (PERSON IN ENTRY ORDER)
NUMBER - NAME -- POSITION ------ MEASURE - INFIT (MNSQ) OUTFI

    122  Q122                       .15     1.4  A    1.4
  RESPONSE:    1:   M   2   2   2   1    1   2   2   2   3
Z-RESIDUAL:                         X    X   2

  RESPONSE:   11:   2   3   5   1   2    2   1   2   3   2
Z-RESIDUAL:                 4   X

  RESPONSE:   21:   1   1   2   2   2    1   3   1   2   1
Z-RESIDUAL:             X               -2       X       X

  RESPONSE:   31:   5   M   5   2   2    1   2   2   4   2
Z-RESIDUAL:

  RESPONSE:   41:   2   2   2   2   1    4   5   3   2   3
Z-RESIDUAL:                         X        X

  RESPONSE:   51:   2   2   1   2   1    1   4   2   1   3
Z-RESIDUAL:                         X    X           X

  RESPONSE:   61:   1   1   5   2   4    5   2   2   4   2
Z-RESIDUAL:         X   X   X            X

  RESPONSE:   71:   2   1   1   2   2    1   3   1   3   1
Z-RESIDUAL:             X  -2                    X       X

  RESPONSE:   81:   4   1   M   1   1    3   M   3   2   2
Z-RESIDUAL:             X

  RESPONSE:   91:   2   1   2   1   1    4   5   2   2   1
Z-RESIDUAL:                     X   X    3   X           X

  RESPONSE:  101:   2   2   2   5   2    4   1   2   3   4
Z-RESIDUAL:                     X        3

  RESPONSE:  111:   2   4   1   2   2    3   M   1   3   1
Z-RESIDUAL:                 X                            X
  RESPONSE:  121:   1   2   2   2   2    4   1   M   2   2
Z-RESIDUAL:

  RESPONSE:  131:   1   1   1   5   3    3   2   2   2   2
Z-RESIDUAL:         X   X       6

  RESPONSE:  141:   3   1   1   1   2    1   2   3   1   1
Z-RESIDUAL:             X   X      -3    X               X

  RESPONSE:  151:   1   1   1   2   3    2   1   2   2   4
Z-RESIDUAL:         X                        X           4

  RESPONSE:  161:   4   2   1   2   5    4   2   2   2   4
Z-RESIDUAL:                 X       X

  RESPONSE:  171:   1   3   2   2   1    1   1   2   M   2
Z-RESIDUAL:         X   2           X        X

  RESPONSE:  181:   1   4   M   1   M    2   2   2   2   2
Z-RESIDUAL:                     X

  RESPONSE:  191:   2   2   2   1   1    2   1   1   2   2
Z-RESIDUAL:                     X  -2

  RESPONSE:  201:   1   3   3   3   1    3   3   2   2   M
Z-RESIDUAL:                         X        2

  RESPONSE:  211:   2   3   1   4   3    1   3   1   2   1
Z-RESIDUAL:                              X       X       X

  RESPONSE:  221:   2   3   2   5   1    1   3   2   4   1
Z-RESIDUAL:                         X    X               X
  RESPONSE:  231:   3   1   2   2   4    1   2   1   1   2
Z-RESIDUAL:             X                X       X

  RESPONSE:  241:   2   2   2   2   4    2   5   4   3   3
Z-RESIDUAL:                         3        X          -3

  RESPONSE:  251:   4   2   3   1   3    2   3   2   M   M
Z-RESIDUAL:                     X

  RESPONSE:  261:   1   1   3   3   2    1   M   3   1   2
Z-RESIDUAL:

  RESPONSE:  271:   1   1   2   2
Z-RESIDUAL:         X   X
```

Figure 24. Person responses of item Q122

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
122	548	258	.32	.14	1.13	1.2	1.08	.7	A .89	.90	73.4	69.9	Q122
124	593	261	-.53	.14	1.05	.5	1.07	.7	B .91	.91	73.5	67.9	Q124
128	531	259	.70	.14	1.06	.6	1.03	.3	C .88	.89	70.1	70.7	Q128
121	539	257	.45	.14	.87	-1.2	.81	-1.7	b .91	.90	80.7	70.2	Q121
125	622	265	-.94	.13	.80	-2.1	.80	-1.9	a .92	.91	77.3	67.5	Q125
MEAN	566.6	260.0	.00	.14	.98	-.2	.96	-.4			75.0	69.2	
S.D.	35.0	2.8	.63	.00	.13	1.3	.12	1.2			3.6	1.3	

Figure 25. Item statistics of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                -- Empirical --    Modeled
Total raw variance in observations     =        18.3 100.0%         100.0%
  Raw variance explained by measures   =        13.3  72.7%          72.2%
    Raw variance explained by persons  =        12.0  65.7%          65.2%
    Raw Variance explained by items    =         1.3   7.1%           7.0%
  Raw unexplained variance (total)     =         5.0  27.3% 100.0%   27.8%
    Unexplned variance in 1st contrast =         1.6   8.8%  32.5%
    Unexplned variance in 2nd contrast =         1.3   7.2%  26.4%
    Unexplned variance in 3rd contrast =         1.0   5.4%  19.9%
```

Figure 26. Standardized residual variance of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
122	548	258	.32	.14	1.13	1.2	1.08	.7	A .89	.89	73.4	69.9	Q122
124	593	261	-.53	.14	1.05	.5	1.07	.7	B .90	.91	73.5	67.9	Q124
128	531	259	.70	.14	1.06	.6	1.03	.3	C .88	.90	70.1	70.7	Q128
121	539	257	.45	.14	.87	-1.2	.81	-1.7	b .92	.90	80.7	70.2	Q121
125	622	265	-.94	.13	.80	-2.1	.80	-1.9	a .91	.90	77.3	67.5	Q125
MEAN	566.6	260.0	.00	.14	.98	-.2	.96	-.4			75.0	69.2	
S.D.	35.0	2.8	.63	.00	.13	1.3	.12	1.2			3.6	1.3	

Figure 27. Displaying point-biserial correlations and other item statistics of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     393  30| -5.65 -5.74|  1.17  1.01||  NONE   |( -6.77)| 1
|  2   2     516  40| -3.13 -3.05|   .83   .86||  -5.66  |  -3.31 | 2
|  3   3     219  17|  -.45  -.62|   .80   .76||   -.95  |    .22 | 3
|  4   4     109   8|  2.30  2.28|  1.13  1.36||   1.41  |   3.32 | 4
|  5   5      63   5|  4.85  5.15|  1.49  1.30||   5.20  |(  6.32)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      40   3| -2.99      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 28. Category structure of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                         |
A      |             2222                                       5|
B   .8 +1          22    22                                   55 +
I      | 1        2        2                   444444        5   |
L      |  1      2          2                 4      4      5    |
I      |   1    2            2               4        4    5     |
T   .6 +    1  2              2    33333    4          4  5      +
Y      |    1 2                2  3     3  4            4 5      |
    .5 +     *                  23       34              *       +
O      |    2 1                 *        43              54      |
F   .4 +    2  1               3 2      4  3           5  4      +
       |   2    1             3   2     4   3         5    4     |
R      |  2      1           3     2   4     3        5     4    |
E      | 2        1         3       2 4       3      5       4   |
S   .2 +2          1       3         *         3   55         44 +
P      |            1    33         4 2         3 5             4|
O      |             11*3         44   22       5*3              |
N      |           3333 1111   444       2225555   3333          |
S   .0 +*********************************************************+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -7      -5      -3      -1       1       3       5       7
        PERSON [MINUS] ITEM MEASURE
```

Figure 29. Category probability curves of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	.48	.16	M	.34	.30	.14	.34	.41	97	.6797	.4662	-.10	121	Q121
F	.27	.16	M	.51	.30	-.24	.34	-.71	101	.4781	.5157	.24	122	Q122
F	-.55	.15	M	-.46	.29	-.10	.33	-.30	95	.7672	.6699	-.34	124	Q124
F	-.86	.15	M	-1.21	.28	.36	.32	1.12	98	.2669	.2626	-.20	125	Q125
F	.66	.16	M	.85	.30	-.19	.34	-.56	101	.5739	.5201	-.55	128	Q128

Figure 30. Gender DIF of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

SUMMARY OF 212 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	11.4	4.8	-2.15	.96	.92	-.3	.93	-.3
S.D.	4.2	.7	2.90	.21	1.25	1.4	1.29	1.4
MAX.	24.0	5.0	6.71	2.48	9.90	4.9	9.90	4.8
MIN.	2.0	1.0	-7.16	.73	.00	-2.3	.00	-2.3

REAL RMSE 1.12 TRUE SD 2.67 SEPARATION 2.39 PERSON RELIABILITY .85
MODEL RMSE .98 TRUE SD 2.73 SEPARATION 2.79 PERSON RELIABILITY .89
S.E. OF PERSON MEAN = .20

MAXIMUM EXTREME SCORE: 7 PERSON
MINIMUM EXTREME SCORE: 52 PERSON
LACKING RESPONSES: 3 PERSON

SUMMARY OF 5 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	566.6	260.0	.00	.14	.98	-.2	.96	-.4
S.D.	35.0	2.8	.63	.00	.13	1.3	.12	1.2
MAX.	622.0	265.0	.70	.14	1.13	1.2	1.08	.7
MIN.	531.0	257.0	-.94	.13	.80	-2.1	.80	-1.9

REAL RMSE .14 TRUE SD .61 SEPARATION 4.25 ITEM RELIABILITY .95
MODEL RMSE .14 TRUE SD .61 SEPARATION 4.36 ITEM RELIABILITY .95
S.E. OF ITEM MEAN = .31

Figure 31. Separations and liabilities of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
   7            .#  +
                 .  |
                    |
                    |
   6                +
                 .  |
                    |
                    |
   5             .  +
                    |
                    |
                    |
   4             .  +
                   T|
                    |
                .#  |
   3                +
                    |
                 #  |
                    |
   2             .  +
                    |
                    |
                 .  |T
   1             .  +
                .# S|S Q128
                    |  Q121
               ###  |  Q122
   0                +M
               .##  |
                 .  |  Q124
              .###  |S
  -1                +  Q125
                    |T
             #####  |
                    |
  -2             .  +
             ##### M|
                    |
                    |
  -3             .  +
        .#########  |
                ##  |
                    |
  -4             .  +
                    |
              .###  |
                    |
  -5               S+
              .###  |
                    |
                 .  |
  -6            ##  +
                    |
                    |
                    |
  -7             .  +
               .##  |
                    |
                    |
  -8 ############# T+
              <less>|<frequ>
EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 32. Person-item map of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    7            .#  +
                  .  |
                     |
                     |
    6                +                             Q128.45
                  .  |                             Q121.45
                     |                             Q122.45
                     |
    5             .  +
                     |                             Q124.45
                     |
                     |                             Q125.45
    4             .  +
                    T|
                     |
                 .#  |
    3                +
                     |
                  #  |
                     |                    Q128.35
    2             .  +                    Q121.35
                     |                    Q122.35
                     |
                  .  |T
    1             .  +                    Q124.35
                 .# S|S
                     |                    Q125.35
                ###  |
    0                +M
                .##  |
                  .  |           Q128.25
               .###  |S          Q121.25
                                 Q122.25
   -1                +
                     |T
              #####  |
                     |           Q124.25
   -2             .  +           Q125.25
              ##### M|
                     |
                     |
   -3             .  +
         .#########  |
                 ##  |
                     |
   -4             .  +
                     |
               .###  |
                     |
   -5               S+  Q128.15
               .###  |  Q121.15
                        Q122.15
                     |
                  .  |
   -6            ##  +
                     |  Q124.15
                     |  Q125.15
                     |
   -7             .  +
                .##  |
                     |
                     |
   -8 ############# T+
               <less>|
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 33. Person-item map - Expected score zones (Rasch-half-point thresholds), of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
122	125	-0.3798
121	125	-0.3311
122	128	-0.3242
122	124	-0.3178
124	128	-0.3084
121	124	-0.2956
121	128	-0.2377
124	125	-0.1796
125	128	-0.0886
121	122	-0.0035

Figure 34. Correlations of residuals for each item pair of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-8    -6     -4     -2      0      2      4      6      8
|------+------+------+------+------+------+------+------|  NUM   ITEM
1      1   :       2       :   3    :     4      :   5  5  128  Q128
1     1   :       2       :   3    :     4      :   5   5  121  Q121
1    1   :        2      :    3    :     4      :  5    5  122  Q122
|                                                       |
|                                                       |
1 1   :        2      :    3    :     4      :  5       5  124  Q124
|                                                       |
11   :       2       :    3   :     4      :   5        5  125  Q125
|------+------+------+------+------+------+------+------|  NUM   ITEM
-8    -6     -4     -2      0      2      4      6      8

5  1      1  1  4   2  2 1 1 1
01 21  82 4  52 512 01 0 421 2 613 2 4  6 2  3  3  1    7  PERSON
   S             M             S             T
0 20      30     50  60 70  80      90                 99  PERCENTILE
```

Figure 35. Construct keymap of revised group 4 comprising 5 items—Q121, Q122, Q124, Q125, and Q128, after removing item Q123 and editing person responses of item Q122

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 24: Career Prospects' work-in-progress figures and tables

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	36.4	100.0%		100.0%
Raw variance explained by measures	=	23.4	64.2%		63.9%
Raw variance explained by persons	=	18.3	50.3%		50.1%
Raw Variance explained by items	=	5.1	13.9%		13.8%
Raw unexplained variance (total)	=	13.0	35.8%	100.0%	36.1%
Unexplned variance in 1st contrast	=	2.6	7.1%	19.9%	
Unexplned variance in 2nd contrast	=	1.6	4.5%	12.6%	
Unexplned variance in 3rd contrast	=	1.6	4.3%	12.1%	
Unexplned variance in 4th contrast	=	1.3	3.7%	10.3%	
Unexplned variance in 5th contrast	=	1.2	3.2%	8.9%	

Figure 1. Standardized residual variance of initial Career Prospects dimension

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER		ITEM	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER		ITEM
1	.65	-.38	.76	.76	A	135	Q135	-.63	-.21	.96	.94	a	144	Q144
1	.50	-.67	.81	.88	B	138	Q138	-.56	.14	1.06	1.03	b	145	Q145
1	.48	-.35	.89	.90	C	141	Q141	-.54	.39	1.00	1.00	c	143	Q143
1	.42	-.21	.90	.90	D	139	Q139	-.42	.33	.83	.93	d	142	Q142
1	.36	-.28	1.12	1.18	E	137	Q137	-.35	.66	1.13	1.10	e	147	Q147
1	.21	-.08	1.10	1.01	F	140	Q140	-.15	.69	1.56	1.74	f	146	Q146
1	.10	-.04	.83	.79	G	136	Q136							

Figure 2. Residual loadings for items in the first contrast of initial Career Prospects dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
       STANDARDIZED RESIDUAL CONTRAST 1 PLOT

      -1                                0                                1
      -+--------------------------------+--------------------------------+- COUNT
   .7 +                                 |                                 +
      |                    A            |                                 | 1
   .6 +                                 |                                 +
      |                                 |                                 |
   .5 +           B         C           |                                 + 2
C     |                                 |                                 |
O  .4 +                          D      |                                 + 1
N     |                        E        |                                 | 1
T  .3 +                                 |                                 +
R     |                                 |                                 |
A  .2 +                               F |                                 + 1
S     |                                 |                                 |
T  .1 +                                G|                                 + 1
      |                                 |                                 |
1  .0 +---------------------------------|---------------------------------+
      |                                 |                                 |
L -.1 +                                 |                                 +
O     |                                 |                      f          | 1
A -.2 +                                 |                                 +
D     |                                 |                                 |
I -.3 +                                 |                                 +
N     |                                 |                     e           | 1
G -.4 +                                 |          d                      + 1
      |                                 |                                 |
  -.5 +                                 |                                 +
      |                                 |    b       c                    | 2
  -.6 +                                 |                                 +
      |                          a      |                                 | 1
      -+--------------------------------+--------------------------------+-
      -1                                0                                1
                                  ITEM MEASURE
 COUNT:           1        11  1 2    11     1     1 1        11
```

Figure 3. The principal component analysis plot of item loading for the first contrast of the initial Career Prospects dimension

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                 -- Empirical --    Modeled
Total raw variance in observations     =         16.8 100.0%         100.0%
  Raw variance explained by measures   =         10.8  64.3%          63.8%
    Raw variance explained by persons  =          8.9  53.1%          52.6%
    Raw Variance explained by items    =          1.9  11.2%          11.1%
  Raw unexplained variance (total)     =          6.0  35.7% 100.0%   36.2%
    Unexplned variance in 1st contrast =          1.9  11.1%  31.1%
    Unexplned variance in 2nd contrast =          1.4   8.1%  22.8%
    Unexplned variance in 3rd contrast =          1.1   6.5%  18.4%
    Unexplned variance in 4th contrast =           .9   5.6%  15.8%
    Unexplned variance in 5th contrast =           .7   4.2%  11.8%
```

Figure 4. Standardized residual variance of group 1 consisting of items Q142 to Q147

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     446  29| -3.34 -3.39|  1.30  1.15||  NONE   |( -4.47)| 1
|  2   2     508  33| -1.90 -1.86|   .82   .84||  -3.32  |  -2.01 | 2
|  3   3     342  22|  -.22  -.18|   .79   .91||   -.62  |    .27 | 3
|  4   4     160  10|  1.36  1.13|   .80   .85||   1.27  |   2.04 | 4
|  5   5      98   6|  1.88  2.14|  1.37  1.58||   2.67  |(  3.93)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      56   3|  -.78      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 5. Category structure of group 1 consisting of items Q142 to Q147

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                       |
B      |                                                       |
A      |1                                                      |
B   .8 + 11                                                   5+
I      |   11                                                5 |
L      |     1                                              5  |
I      |      1        222222                             55   |
T   .6 +       1     22       22                         5     +
Y      |        11  2           22      3333            5      |
    .5 +          *2              2  33     33    44444  5     +
O      |         2 1               *3          3344     4*     |
F   .4 +        2   1             3 22          43      5 44   +
       |      22     1          33    2       44  3    5    44 |
R      |     2         11         3      2    4     33 5      4 |
E      |   22            1    3           2 4         *       44 |
S   .2 + 22               1 33            4*2         5 3       4+
P      |2                 3*1            4    2    55    33      |
O      |               333    111      444      2255        33    |
N      |           3333            ****        55552222       3333 |
S   .0 +***********************5555******11111111**************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4
        PERSON [MINUS] ITEM MEASURE
```

Figure 6. Category probabilities of group 1 consisting of items Q142 to Q147

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
146	566	259	.42	.11	1.58	5.1	1.62	5.4	A .77	.84	60.0	58.7	Q146
147	560	256	.39	.11	1.00	.0	1.04	.5	B .82	.83	65.9	58.7	Q147
145	605	253	-.23	.10	.91	-1.0	.89	-1.2	C .86	.85	71.0	56.9	Q145
142	607	260	.02	.10	.83	-1.9	.89	-1.1	c .86	.84	68.5	57.5	Q142
143	595	260	.06	.10	.87	-1.4	.86	-1.6	b .86	.84	66.8	58.2	Q143
144	685	266	-.66	.10	.76	-2.7	.76	-2.8	a .89	.86	67.1	54.5	Q144
MEAN	603.0	259.0	.00	.11	.99	-.3	1.01	-.1			66.6	57.4	
S.D.	40.9	4.0	.37	.00	.27	2.6	.28	2.6			3.4	1.4	

Figure 6. Item statistics of group 1 consisting of items Q142 to Q147

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
147	560	256	.58	.12	1.31	2.9	1.33	3.0	A .82	.86	66.8	62.5	Q147
142	607	260	.12	.11	.96	-.4	1.00	.0	B .87	.87	67.7	61.6	Q142
145	605	253	-.18	.12	.98	-.2	.95	-.5	C .88	.88	71.3	61.0	Q145
143	595	260	.17	.12	.92	-.8	.89	-1.1	b .88	.87	68.7	62.1	Q143
144	685	266	-.69	.11	.77	-2.6	.78	-2.4	a .91	.89	73.6	58.6	Q144
MEAN	610.4	259.0	.00	.11	.99	-.2	.99	-.2			69.6	61.2	
S.D.	40.9	4.4	.42	.00	.18	1.8	.18	1.8			2.5	1.4	

Figure 7. Item statistics of group 1 consisting of items Q142 to Q147, after deleting item Q146.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
142	607	260	.32	.12	1.15	1.5	1.15	1.5	A .88	.89	67.0	64.8	Q142
143	595	260	.39	.13	1.01	.2	.97	-.3	B .90	.89	71.4	65.1	Q143
145	605	253	-.06	.13	1.00	.0	.96	-.3	b .90	.90	73.9	64.0	Q145
144	685	266	-.65	.12	.79	-2.3	.78	-2.3	a .93	.91	78.4	63.7	Q144
MEAN	623.0	259.8	.00	.12	.99	-.2	.97	-.4			72.7	64.4	
S.D.	36.1	4.6	.41	.00	.13	1.4	.13	1.4			4.1	.5	

Figure 8. Item statistics of group 1 consisting of items Q142 to Q147, after deleting items Q146 and Q147.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
    6          .##  +
                    |
                    |
                    |
                 .  |
    5               +
                    |
                    |
                    |
                 .  |
    4              T+
                    |
                 .  |
                    |
                 .  |
    3               +
               .##  |
                    |
                    |
                .#  |
    2            .  +
                    |
               .##  |
                   S|
                 .  |
    1            #  +
                    |T
                 .  |
           .######  |S Q142   Q143
                 .  |
    0               +M Q145
                    |
               .##  |S
                 .  |  Q144
                 .  |T
   -1          .##  +
                   M|
                    |
                 .  |
               .##  |
   -2               +
                    |
                    |
                    |
         .########  |
   -3            .  +
                    |
                    |
                    |
               ###  |
   -4              S+
                 .  |
                 .  |
                    |
              .###  |
   -5            .  +
                    |
                    |
                    |
                    |
   -6  .##########  +
              <less>|<frequ>
EACH "#" IS 5. EACH "." IS 1 TO 4
```

Figure 9. Person-item map of group 1 consisting of items Q142 to Q147, after deleting items Q146 and Q147.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
143	595	260	.61	.14	1.07	.7	1.03	.3	A .91	.91	71.0	68.0	Q143
144	685	266	-.65	.14	.99	.0	.96	-.3	B .93	.93	80.9	67.8	Q144
145	605	253	.04	.14	.87	-1.2	.83	-1.5	a .93	.92	78.9	70.1	Q145
MEAN	628.3	259.7	.00	.14	.98	-.2	.94	-.5			76.9	68.6	
S.D.	40.3	5.3	.52	.00	.08	.8	.08	.7			4.3	1.0	

Figure 10. Item statistics of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	11.2	100.0%		100.0%
Raw variance explained by measures	=	8.2	73.1%		72.6%
Raw variance explained by persons	=	7.6	67.9%		67.4%
Raw Variance explained by items	=	.6	5.3%		5.2%
Raw unexplained variance (total)	=	3.0	26.9%	100.0%	27.4%
Unexplned variance in 1st contrast	=	1.6	14.1%	52.6%	
Unexplned variance in 2nd contrast	=	1.4	12.6%	47.0%	
Unexplned variance in 3rd contrast	=	.0	.1%	.2%	
Unexplned variance in 4th contrast	=	.0	.0%	.1%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 11. Standardized residual variance of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	204	26	-5.33	-5.48	1.41	1.11	NONE	(-6.99)	1
2	2	246	32	-3.20	-3.16	.96	.94	-5.89	-3.49	2
3	3	182	23	.20	.28	.72	.70	-1.08	.51	3
4	4	92	12	2.77	2.50	.79	.91	2.13	3.49	4
5	5	55	7	3.82	4.20	1.41	1.42	4.84	(5.99)	5
MISSING		20	3	.14						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 12. Category structure of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                        5|
A      |            22222                                     55 |
B   .8 +          22     22                                  5   +
I      |1        2         2                                5    |
L      | 1      2           2       33333                  5     |
I      |  1    2             2     3     3      44444     5      |
T   .6 +   1  2               2   3       3    4     4   5       +
Y      |    12                 2 3         3  4       4 5        |
    .5 +    *                  23           34         *         +
O      |    21                 32           43         54        |
F   .4 +   2  1               3  2         4  3       5  4       +
       |  2    1             3    2       4   3      5    4      |
R      | 2      1           3      2     4     3    5      4     |
E      |2        1         3        2    4      3   5       4    |
S   .2 +          1       3          2 44        3 5         4   +
P      |           11    3            *          5*3          44 |
O      |             1*33           44 22       5   3           4|
N      |          3333 1111      444     2225555     3333        |
S   .0 +*********************************************************+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -7      -5      -3      -1       1       3       5       7
        PERSON [MINUS] ITEM MEASURE
```

Figure 13. Category probability curves of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	.58	.16	M	.76	.30	-.18	.34	-.52	91	.6012	.7354	.01	143	Q143
F	-.62	.15	M	-.78	.30	.16	.33	.49	90	.6237	.5227	-.19	144	Q144
F	.04	.16	M	.04	.30	.00	.34	.00	89	1.000	.7073	.11	145	Q145

Figure 13. Gender DIF of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 206 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	7.6	2.9	-1.16	1.19	.89	-.4	.90	-.4
S.D.	2.5	.3	3.08	.20	1.52	1.4	1.54	1.4
MAX.	14.0	3.0	5.67	2.55	9.90	5.3	9.90	5.3
MIN.	2.0	1.0	-6.63	.98	.00	-1.8	.00	-1.8

REAL RMSE 1.44 TRUE SD 2.72 SEPARATION 1.89 PERSON RELIABILITY .78
MODEL RMSE 1.21 TRUE SD 2.83 SEPARATION 2.35 PERSON RELIABILITY .85
S.E. OF PERSON MEAN = .22

MAXIMUM EXTREME SCORE: 13 PERSON
MINIMUM EXTREME SCORE: 51 PERSON
LACKING RESPONSES: 4 PERSON

SUMMARY OF 3 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	628.3	259.7	.00	.14	.98	-.2	.94	-.5
S.D.	40.3	5.3	.52	.00	.08	.8	.08	.7
MAX.	685.0	266.0	.61	.14	1.07	.7	1.03	.3
MIN.	595.0	253.0	-.65	.14	.87	-1.2	.83	-1.5

REAL RMSE .14 TRUE SD .50 SEPARATION 3.53 ITEM RELIABILITY .93
MODEL RMSE .14 TRUE SD .50 SEPARATION 3.58 ITEM RELIABILITY .93
S.E. OF ITEM MEAN = .37

DELETED: 3 ITEM

Figure 14. Separations and reliabilities of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
 6             .###  +
                  .  |
                     |
                     |
 5                  T+
                     |
                  .  |
                     |
 4                   +
                     |
             .####   |
                  .  |
 3                   +
                  .  |
               .##   |
                     |
 2                . S+
                  .  |
              .###   |
                     |
 1                   +T
                  .  |
        .#########   |S  Q143
                     |
 0                   +M  Q145
                     |
             .####   |S
                     |   Q144
-1                   +T
                    M|
                     |
              ####   |
-2                   +
                     |
                     |
                     |
-3                   +
                     |
     .############   |
                     |
-4                   +
                  . S|
                     |
                     |
-5                   +
            .#####   |
                     |
                     |
-6                .  +
                     |
                     |
               .##   |
-7   .############   +
              <less>|<frequ>
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 15. Person-item map of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
               <more>|
    6          .###  +
                  .  |
                     |                             Q143.45
                     |
    5               T+                             Q145.45
                     |
                  .  |
                     |                             Q144.45
    4                +
                     |
              .####  |
                  .  |
    3                +
                  .  |                    Q143.35
                .##  |
                     |
    2             . S+                    Q145.35
                  .  |
               .###  |                    Q144.35
                     |
    1                +T
                  .  |
         .#########  |S
                     |
    0                +M
                     |
              .####  |S          Q143.25
                     |
   -1                +T
                    M|           Q145.25
                     |
               ####  |           Q144.25
   -2                +
                     |
                     |
                     |
   -3                +
                     |
      .############  |
                     |
   -4                +
                  . S|
                     |
                     |
   -5                +
             .#####  |  Q143.15
                     |
                     |
   -6             .  +  Q145.15
                     |
                     |  Q144.15
                .##  |
   -7 .############  +
               <less>|
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 16. Person-item map: Expected score zones (Rasch-half-point thresholds), of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
143	144	-0.5869
143	145	-0.4534
144	145	-0.4501

Figure 17. Correlations of residuals for each item pair of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-8    -6     -4     -2      0      2      4      6      8
|------+------+------+------+------+------+------+------|  NUM   ITEM
1     1  :        2       :     3    :    4     :  5    5  143  Q143
|                                                       |
1   1  :        2       :     3    :    4     :  5      5  145  Q145
|                                                       |
11   :        2       :     3    :    4    :   5        5  144  Q144
|------+------+------+------+------+------+------+------|  NUM   ITEM
-8    -6     -4     -2      0      2      4      6      8

4    1    2     4     1   1   3  1      1            1
9    0 4  1   1 9     6   7   91 312 9128   1 2 3   10     PERSON
      S              M              S              T
0 10 20  30    40    50  60  70 80     90           99     PERCENTILE
```

Figure 18. Construct keymap of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
143	595	260	.61	.14	1.07	.7	1.03	.3	A .90	.90	71.0	68.0	Q143
144	685	266	-.65	.14	.99	.0	.96	-.3	B .86	.87	80.9	67.8	Q144
145	605	253	.04	.14	.87	-1.2	.83	-1.5	a .92	.91	78.9	70.1	Q145
MEAN	628.3	259.7	.00	.14	.98	-.2	.94	-.5			76.9	68.6	
S.D.	40.3	5.3	.52	.00	.08	.8	.08	.7			4.3	1.0	

Figure 19. Item statistics of group 1 consisting of items Q142 to Q147, after deleting items Q146, Q147 and Q142, showing point-biserial correlations

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
140	632	254	.29	.11	1.36	3.5	1.29	2.8	A .83	.86	64.1	59.4	Q140
137	649	249	.01	.11	1.20	2.0	1.20	2.0	B .85	.87	69.3	59.2	Q137
136	664	264	.32	.11	1.09	1.0	1.05	.5	C .86	.86	69.3	59.3	Q136
141	664	254	-.09	.11	.93	-.7	.95	-.5	D .88	.87	69.9	59.3	Q141
139	669	261	.11	.11	.94	-.6	.92	-.8	c .88	.87	63.6	59.0	Q139
138	756	272	-.50	.10	.77	-2.7	.80	-2.3	b .89	.87	69.8	58.1	Q138
135	673	256	-.13	.11	.67	-3.9	.67	-3.8	a .90	.87	74.2	59.2	Q135
MEAN	672.4	258.6	.00	.11	.99	-.2	.98	-.3			68.6	59.1	
S.D.	36.5	7.1	.26	.00	.23	2.4	.20	2.1			3.4	.4	

Figure 20. Item statistics: misfit order, of group 2 consisting of items Q135 to Q141

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
          PERSON - MAP - ITEM
              <more>|<rare>
 5            #####  +
                     |
                     |
                     |
                     |
 4                   +
                    T|
                 .   |
                     |
                .#   |
 3                   +
                .#   |
                 #   |
             #####   |
                 #   |
 2               .   +
               .##   |
               .## S|
                 .   |
               .##   |
 1              .#   +
                     |
               ###   |T
         #########   |   Q136
                 .   |S  Q139    Q140
 0             .##   +M  Q137    Q141
                     |S  Q135
                .#   |   Q138
               .##   |T
                 .  M|
-1            .###   +
                     |
              .###   |
                 .   |
              .###   |
-2                   +
       .##########   |
                 .   |
                     |
              .###   |
-3               .  S+
             .####   |
                 .   |
              .###   |
                     |
-4                   +
                 .   |
                     |
                     |
                .#   |
-5                   +
                    T|
                     |
               .##   |
                     |
-6       .########   +
              <less>|<frequ>
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 21. Person-item map of group 2 consisting of items Q135 to Q141

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
137	649	249	.06	.12	1.18	1.7	1.15	1.4	A .87	.88	72.6	62.1	Q137
136	664	264	.40	.11	1.11	1.2	1.10	1.0	B .87	.88	68.4	61.1	Q136
141	664	254	-.05	.11	1.08	.8	1.11	1.1	C .88	.88	66.7	62.0	Q141
139	669	261	.18	.11	1.10	1.0	1.07	.8	c .88	.88	63.5	61.8	Q139
138	756	272	-.50	.11	.79	-2.4	.80	-2.2	b .90	.89	74.6	60.7	Q138
135	673	256	-.09	.11	.69	-3.6	.69	-3.6	a .92	.89	76.6	62.0	Q135
MEAN	679.2	259.3	.00	.11	.99	-.2	.98	-.3			70.4	61.6	
S.D.	35.2	7.4	.28	.00	.18	2.0	.17	1.9			4.6	.5	

Figure 22. Item statistics: misfit order, of group 2 consisting of items Q135 to Q141 after removing item Q140

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	19.5	100.0%		100.0%
Raw variance explained by measures	=	13.5	69.3%		69.0%
Raw variance explained by persons	=	12.0	61.3%		61.0%
Raw Variance explained by items	=	1.6	8.0%		8.0%
Raw unexplained variance (total)	=	6.0	30.7%	100.0%	31.0%
Unexplned variance in 1st contrast	=	1.7	8.6%	28.1%	
Unexplned variance in 2nd contrast	=	1.3	6.9%	22.5%	
Unexplned variance in 3rd contrast	=	1.2	6.1%	19.9%	
Unexplned variance in 4th contrast	=	1.0	5.0%	16.4%	
Unexplned variance in 5th contrast	=	.8	4.0%	13.1%	

Figure 23. Standardized residual variance of group 2 comprising items Q135 to Q141 after removing item Q140.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
137	649	249	.06	.12	1.18	1.7	1.15	1.4	A .82	.86	72.6	62.1	Q137
136	664	264	.40	.11	1.11	1.2	1.10	1.0	B .81	.83	68.4	61.1	Q136
141	664	254	-.05	.11	1.08	.8	1.11	1.1	C .88	.88	66.7	62.0	Q141
139	669	261	.18	.11	1.10	1.0	1.07	.8	c .89	.86	63.5	61.8	Q139
138	756	272	-.50	.11	.79	-2.4	.80	-2.2	b .84	.83	74.6	60.7	Q138
135	673	256	-.09	.11	.69	-3.6	.69	-3.6	a .90	.88	76.6	62.0	Q135
MEAN	679.2	259.3	.00	.11	.99	-.2	.98	-.3			70.4	61.6	
S.D.	35.2	7.4	.28	.00	.18	2.0	.17	1.9			4.6	.5	

Figure 24. Item statistics: misfit order, of group 2 consisting of items Q135 to Q141 after removing item Q140, showing point-biserial correlations

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	316	20	-3.63	-3.80	1.48	1.30	NONE	(-5.23)	1
2	2	479	31	-2.30	-2.21	.88	.88	-4.10	-2.56	2
3	3	397	26	-.07	-.04	.82	.86	-.99	.28	3
4	4	210	13	1.97	1.84	.69	.69	1.60	2.57	4
5	5	154	10	3.15	3.19	1.19	1.30	3.49	(4.69)	5
MISSING		67	4	-.37						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 25. Category structure, of group 2 consisting of items Q135 to Q141 after removing item Q140, showing point-biserial correlations

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                             |
B      |                                                          555|
A      |11                                                      55   |
B   .8 +  11                                                  55     +
I      |    1                                                5       |
L      |     1         22222                                5        |
I      |      1      22     22        3333                 5         |
T   .6 +       1    2         2     33    33              5          +
Y      |        1  2           2   3        3    44444   5           |
    .5 +         12             2 3          3 44     445            +
O      |         21              *            *        54            |
F   .4 +        2  1           33 2          4 3      5  4           +
       |      22    1         3    22       4   3    5    4          |
R      |     2       1       3       2     4     3  5      44        |
E      |    2         11    3         2  44       35         4       |
S   .2 +  22            1  3           24         53          44     +
P      |22               **           4422       5  33          44   |
O      |               33  11       44    22   55     33          44 |
N      |          33333      111*444       5***         333         4|
S   .0 +************************5**********1111**********************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 26. Category probability curves of group 2 consisting of items Q135 to Q141 after removing item Q140

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.09	.13	M	-.09	.23	.00	.26	.00	125	1.000	.2854	1.39	135	Q135
F	.35	.13	M	.56	.23	-.21	.26	-.79	127	.4295	.3092	-.23	136	Q136
F	.19	.13	M	-.34	.23	.53	.26	2.01	121	.0462	.1543	.02	137	Q137
F	-.53	.13	M	-.40	.22	-.13	.25	-.51	131	.6136	.2894	.61	138	Q138
F	.18	.13	M	.21	.22	-.03	.26	-.12	127	.9051	.5447	.29	139	Q139
F	-.09	.13	M	.06	.23	-.15	.26	-.56	122	.5755	.4068	-.05	141	Q141

Figure 27. Gender DIF of group 2 consisting of items Q135 to Q141 after removing item Q140

SUMMARY OF 232 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	15.3	5.7	-.76	.72	1.00	-.7	.99	-.7
S.D.	5.5	.8	2.39	.12	1.31	2.1	1.31	2.1
MAX.	29.0	6.0	5.18	1.18	9.27	4.9	9.29	4.9
MIN.	5.0	2.0	-5.75	.60	.02	-3.8	.02	-3.8

REAL RMSE .88 TRUE SD 2.22 SEPARATION 2.53 PERSON RELIABILITY .86
MODEL RMSE .73 TRUE SD 2.28 SEPARATION 3.10 PERSON RELIABILITY .91
S.E. OF PERSON MEAN = .16

MAXIMUM EXTREME SCORE: 14 PERSON
MINIMUM EXTREME SCORE: 28 PERSON

SUMMARY OF 6 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	679.2	259.3	.00	.11	.99	-.2	.98	-.3
S.D.	35.2	7.4	.28	.00	.18	2.0	.17	1.9
MAX.	756.0	272.0	.40	.12	1.18	1.7	1.15	1.4
MIN.	649.0	249.0	-.50	.11	.69	-3.6	.69	-3.6

REAL RMSE .12 TRUE SD .25 SEPARATION 2.12 ITEM RELIABILITY .82
MODEL RMSE .11 TRUE SD .25 SEPARATION 2.22 ITEM RELIABILITY .83
S.E. OF ITEM MEAN = .12

DELETED: 1 ITEM

Figure 28. Separations and liabilities of group 2 consisting of items Q135 to Q141 after removing item Q140

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
               PERSON - MAP - ITEM
                   <more>|<rare>
   6            .####  +
                       |
                       |
                       |
                    .  |
   5                   +
                       |
                       |
                    .  |
                       |
   4                  T+
                    .  |
                    .  |
                    #  |
                    .  |
   3               .#  +
                       |
               ######  |
                       |
                  .##  |
   2                .  +
                    #  |
                    . S|
                   .#  |
                    .  |
   1               ##  +
                    .  |
                 .###  |T
                    .  |  Q136
           .#########  |S Q139
   0                   +M Q135    Q137    Q141
                   ##  |S
                       |  Q138
                 .###  |T
                    . M|
  -1              ###  +
                    .  |
                       |
                  .##  |
                    .  |
  -2            .####  +
                       |
                       |
        .############  |
                       |
  -3                   +
              .###### S|
                    .  |
                .####  |
                       |
  -4                .  +
                    .  |
                       |
                       |
                    #  |
  -5                   +
                       |
                       |
                      T|
                  .##  |
  -6       .#########  +
                   <less>|<frequ>
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 29. Person-item map of group 2 consisting of items Q135 to Q141 after removing item Q140

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
                <more>|
    6          .####  +
                      |
                      |
                      |
                   .  |
    5                 +
                      |
                      |
                   .  |
                      |                             Q136.45
    4                T+                             Q139.45
                   .  |                             Q137.45
                                                    Q141.45
                   .  |                             Q135.45
                   #  |
                   .  |                             Q138.45
    3             .#  +
                      |
              ######  |
                      |
                 .##  |
    2              .  +
                   #  |                    Q136.35
                   . S|                    Q137.35
                                           Q139.35
                  .#  |                    Q135.35
                                           Q141.35
                   .  |
    1             ##  +                    Q138.35
                   .  |
                .###  |T
                   .  |
          .#########  |S
    0                 +M
                  ##  |S
                      |
                .###  |T         Q136.25
                   . M|          Q139.25
   -1            ###  +          Q137.25
                                 Q141.25
                   .  |          Q135.25
                      |
                 .##  |          Q138.25
                   .  |
   -2          .####  +
                      |
                      |
       .############  |
                      |
   -3                 +
             .###### S|
                   .  |
               .####  |
                      | Q136.15
   -4              .  + Q139.15
                   .  | Q137.15
                        Q141.15
                      | Q135.15
                      |
                   #  | Q138.15
   -5                 +
                      |
                      |
                     T|
                 .##  |
   -6     .#########  +
                <less>|
 EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 30. Person-item map: Expected score zones (Rasch-half-point thresholds), of group 2 consisting of items Q135 to Q141 after removing item Q140

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
136	141	-0.4181
137	139	-0.3389
135	138	-0.3064
137	141	-0.2866
138	141	-0.2467
135	139	-0.2427
135	136	-0.2305
135	137	-0.2033
139	141	-0.1967
136	138	-0.1583
138	139	-0.1549
136	137	-0.1396
136	139	-0.1179
137	138	-0.0992
135	141	0.1634

Figure 31. Correlations of residuals for each item pair of group 2 consisting of items Q135 to Q141 after removing item Q140

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-6       -4        -2         0         2         4         6
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
1     1    :       2       :     3     :     4     :   5    5  136  Q136
|                                                           |
1    1    :       2       :     3     :     4     :   5     5  139  Q139
1   1    :        2      :      3     :    4     :    5     5  137  Q137
1   1    :       2       :     3     :     4     :   5      5  141  Q141
1  1    :        2      :      3     :    4     :    5      5  135  Q135
|                                                           |
|                                                           |
11    :        2      :      3     :    4     :    5        5  138  Q138
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
-6       -4        -2         0         2         4         6

2           1 1  3  1      1   2 1         1                1
78    3  21 319  7  428 1910 6 91016142317 8 51311  2 1 2 1 2  PERSON
        S                M                S               T
0 10        20  40      50    60 70    80   90             99  PERCENTILE
```

Figure 32. Construct keymap of group 2 consisting of items Q135 to Q141 after removing item Q140

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 25: Accommodation's work-in-progress figures and tables

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
154	599	263	.41	.09	1.66	5.8	1.92	7.3	A .69	.80	50.0	54.5	Q154
151	661	252	-.31	.09	1.10	1.1	1.12	1.3	B .81	.82	60.5	51.8	Q151
148	549	258	.82	.10	1.07	.7	1.03	.3	C .78	.79	57.5	55.9	Q148
155	645	254	-.10	.09	.99	-.1	1.07	.7	D .81	.82	56.9	52.1	Q155
153	592	249	.19	.10	.98	-.2	.91	-.9	d .82	.81	61.6	53.5	Q153
152	736	251	-.94	.09	.95	-.5	.98	-.2	c .83	.82	62.8	49.8	Q152
149	616	248	.03	.09	.58	-5.1	.59	-4.8	b .87	.81	68.2	53.0	Q149
150	609	242	-.10	.09	.56	-5.3	.54	-5.4	a .88	.82	72.0	52.3	Q150
MEAN	625.9	252.1	.00	.09	.99	-.4	1.02	-.2			61.2	52.9	
S.D.	52.3	6.0	.48	.00	.32	3.3	.40	3.7			6.4	1.7	

Figure 1. Item statistics, in misfit order, of initial Accommodation dimension

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
155	645	254	-.03	.10	1.16	1.6	1.35	3.2	A .82	.85	56.2	54.6	Q155
148	549	258	1.02	.11	1.22	2.1	1.16	1.4	B .80	.82	57.3	58.7	Q148
151	661	252	-.30	.10	1.16	1.6	1.15	1.5	C .84	.85	60.6	54.2	Q151
153	592	249	.28	.10	1.16	1.6	1.07	.7	D .83	.84	59.4	55.9	Q153
152	736	251	-1.04	.10	1.02	.3	1.06	.6	c .85	.85	61.6	52.4	Q152
149	616	248	.11	.10	.65	-4.1	.67	-3.7	b .88	.85	65.7	54.8	Q149
150	609	242	-.05	.10	.59	-4.8	.57	-5.1	a .90	.85	71.5	54.6	Q150
MEAN	629.7	250.6	.00	.10	.99	-.3	1.00	-.2			61.8	55.0	
S.D.	54.9	4.7	.57	.00	.25	2.7	.26	2.8			4.9	1.8	

Figure 2. Item statistics, in misfit order, of Accommodation dimension after removal of item Q154

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
155	645	254	-.03	.10	1.04	.5	1.19	1.9	A .83	.84	59.0	53.9	Q155
148	549	258	.97	.10	1.18	1.8	1.13	1.2	B .79	.82	58.2	57.8	Q148
153	592	249	.26	.10	1.12	1.2	1.02	.2	C .83	.84	59.9	54.1	Q153
151	661	252	-.29	.10	1.05	.6	1.03	.3	c .84	.85	59.7	52.8	Q151
152	736	251	-1.00	.09	.93	-.7	.96	-.4	b .86	.85	60.2	51.7	Q152
149	616	248	.09	.10	.65	-4.1	.66	-3.8	a .88	.84	66.7	54.1	Q149
MEAN	633.2	252.0	.00	.10	1.00	-.1	1.00	-.1			60.6	54.1	
S.D.	58.5	3.3	.59	.00	.17	1.9	.17	1.8			2.8	1.9	

Figure 3. Item statistics, in misfit order, of the 6-item Accommodation dimension after removal of items Q154 and Q150

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                  -- Empirical --    Modeled
Total raw variance in observations     =          17.5 100.0%         100.0%
  Raw variance explained by measures   =          11.5  65.7%          65.5%
    Raw variance explained by persons  =           8.1  46.5%          46.3%
    Raw Variance explained by items    =           3.4  19.2%          19.2%
  Raw unexplained variance (total)     =           6.0  34.3% 100.0%   34.5%
    Unexplned variance in 1st contrast =           1.8  10.5%  30.6%
    Unexplned variance in 2nd contrast =           1.3   7.4%  21.6%
    Unexplned variance in 3rd contrast =           1.1   6.5%  19.1%
    Unexplned variance in 4th contrast =            .9   5.4%  15.7%
    Unexplned variance in 5th contrast =            .8   4.4%  12.8%
```

Figure 4. Standardized residual variance of the 6-item Accommodation dimension after removal of items Q154 and Q150

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
---------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     400  26| -2.92 -2.97|  1.27  1.18||  NONE   |( -3.95)| 1
|  2   2     447  30| -1.45 -1.43|   .99  1.01||   -2.78 |  -1.68 | 2
|  3   3     319  21|  -.25  -.17|   .83   .89||    -.45 |    .20 | 3
|  4   4     182  12|  1.16  1.04|   .80   .78||     .99 |   1.72 | 4
|  5   5     164  11|  2.31  2.32|  1.10  1.13||    2.24 |(  3.51)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      62   4|  -.60      |            ||         |        |
---------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 5. Category structure of the 6-item Accommodation dimension after removal of misfitting items Q154 and Q150

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                                                         |
A      |                                                       55|
B   .8 +                                                     55  +
I      |11                                                  5    |
L      |  11                                              55     |
I      |    1                                            5       |
T   .6 +     1       2222222                           55        +
Y      |      11   22       22                        5          |
    .5 +        122           22    3333             5           +
O      |       221              2333    33   4444444*            |
F   .4 +      2   11           3322       3*4      5 44          +
       |    22      1         3    2     44 33    5    44        |
R      |  22         1      33      2   4     3 55       44      |
E      |22            11   3         2*4       *3          44    |
S   .2 +                1*3         44 2      5  3           44  +
P      |              333 11      44    22  55    33           44|
O      |            33      111 44        **        333          |
N      |      333333       4444*111  55555  22222      33333     |
S   .0 +*******************55555555**11111111111*****************+
E      -+------+------+------+------+------+------+------+------+-
       -4     -3     -2     -1      0      1      2      3      4
        PERSON [MINUS] ITEM MEASURE
```

Figure 6. Category probability curves of the 6-item Accommodation dimension after removal of misfitting items Q154 and Q150

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	.79	.12	M	1.54	.22	-.75	.25	-3.02	127	.0031	.0090	-.53	148	Q148
F	.09	.12	M	.09	.19	.00	.23	.00	127	1.000	.6033	.13	149	Q149
F	-.29	.11	M	-.34	.19	.05	.22	.23	130	.8219	.9407	.14	151	Q151
F	-.82	.11	M	-1.50	.18	.68	.21	3.18	130	.0018	.0058	.19	152	Q152
F	.23	.12	M	.34	.20	-.11	.23	-.49	129	.6253	.9333	-.44	153	Q153
F	-.06	.11	M	.03	.19	-.09	.22	-.40	129	.6880	.3867	.05	155	Q155

Figure 7. Gender DIF analysis of the 6-item Accommodation dimension after removal of misfitting items Q154 and Q150

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	Welch t	d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	.28	.12	M	.38	.20	-.10	.24	-.40	125	.6873	.8214	-.23	149	Q149
F	-.11	.12	M	-.06	.20	-.05	.23	-.20	127	.8426	.8273	-.24	151	Q151
F	-.71	.12	M	-1.32	.19	.61	.22	2.73	128	.0072	.0036	.78	152	Q152
F	.44	.12	M	.70	.21	-.27	.24	-1.11	126	.2708	.4786	-.44	153	Q153
F	.10	.12	M	.35	.20	-.25	.23	-1.08	127	.2808	.0728	-.34	155	Q155

Figure 8. Gender DIF analysis of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
155	645	254	.16	.10	1.08	.8	1.19	1.9	A .84	.86	55.9	54.5	Q155
153	592	249	.50	.11	1.17	1.7	1.04	.5	B .84	.85	63.8	55.3	Q153
151	661	252	-.11	.10	1.03	.4	1.03	.4	C .86	.86	63.0	54.5	Q151
152	736	251	-.87	.10	.89	-1.2	.90	-1.1	b .88	.86	62.1	51.8	Q152
149	616	248	.31	.10	.80	-2.2	.81	-2.0	a .88	.85	62.0	55.2	Q149
MEAN	650.0	250.8	.00	.10	.99	-.1	1.00	-.1			61.4	54.3	
S.D.	49.1	2.1	.48	.00	.13	1.4	.13	1.3			2.8	1.3	

Figure 9. Item statistics, in misfit order, of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		Empirical			Modeled
Total raw variance in observations	=	14.3	100.0%		100.0%
Raw variance explained by measures	=	9.3	65.0%		64.7%
Raw variance explained by persons	=	6.9	48.0%		47.8%
Raw Variance explained by items	=	2.4	16.9%		16.9%
Raw unexplained variance (total)	=	5.0	35.0%	100.0%	35.3%
Unexplned variance in 1st contrast	=	1.7	12.2%	34.9%	
Unexplned variance in 2nd contrast	=	1.3	9.1%	26.1%	
Unexplned variance in 3rd contrast	=	1.0	7.2%	20.6%	
Unexplned variance in 4th contrast	=	.9	6.4%	18.4%	
Unexplned variance in 5th contrast	=	.0	.0%	.1%	

Figure 10. Standardized residual variance of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

ITEM STATISTICS: CORRELATION ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
155	645	254	.16	.10	1.08	.8	1.19	1.9	.80	.82	55.9	54.5	Q155
151	661	252	-.11	.10	1.03	.4	1.03	.4	.86	.86	63.0	54.5	Q151
149	616	248	.31	.10	.80	-2.2	.81	-2.0	.86	.85	62.0	55.2	Q149
153	592	249	.50	.11	1.17	1.7	1.04	.5	.86	.87	63.8	55.3	Q153
152	736	251	-.87	.10	.89	-1.2	.90	-1.1	.87	.85	62.1	51.8	Q152
MEAN	650.0	250.8	.00	.10	.99	-.1	1.00	-.1			61.4	54.3	
S.D.	49.1	2.1	.48	.00	.13	1.4	.13	1.3			2.8	1.3	

Figure 11. Item statistics, in point-biserial correlation order, of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     308  25| -2.91 -2.99|  1.33  1.22||  NONE   |( -4.12)| 1
|  2   2     351  28| -1.55 -1.51|   .95   .98||  -2.95  |  -1.84 | 2
|  3   3     285  23|  -.25  -.17|   .78   .83||   -.62  |    .16 | 3
|  4   4     165  13|  1.27  1.11|   .81   .81||   1.01  |   1.87 | 4
|  5   5     145  12|  2.39  2.44|  1.17  1.19||   2.56  |(  3.80)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      47   4|  -.45      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 12. Category structure of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                        +
O      |                                                        |
B      |1                                                       |
A      | 11                                                     |
B   .8 +   11                                                  5+
I      |     11                                              55 |
L      |       1                                            5   |
I      |        1                                          5    |
T   .6 +         11      2222222                         55     +
Y      |           1  22        2                       5       |
    .5 +            12           22  3333333    444444 5        +
O      |           221             *3        3 44     *4        |
F   .4 +         2   1            3 2        4*3     5  4       +
       |        2     1          3   2     4   3    5    44     |
R      |      22       1       33     2   4     3  5       4    |
E      |    22          11   3         224       35         44  |
S   .2 +  22              *3           442       533          44+
P      | 22             33 11        4   22    55    33         |
O      |2             33     11  444      2*5          33       |
N      |         33333       44**111   5555 2222      3333      |
S   .0 +**********************5555555***111111111**************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4
        PERSON [MINUS] ITEM MEASURE
```

Figure 13. Category probability curves of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM	ITEM	Correlation
149	151	-0.3924
151	153	-0.3729
152	153	-0.3698
152	155	-0.3387
149	152	-0.3054
153	155	-0.2804
151	155	-0.2636
149	155	-0.194
151	152	-0.005
149	153	0.0409

Figure 14. Correlations of residuals for each item pair of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

SUMMARY OF 219 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	12.6	4.8	-.69	.71	1.00	-.3	.99	-.3
S.D.	4.7	.7	1.87	.16	1.11	1.6	1.08	1.6
MAX.	24.0	5.0	4.13	1.54	5.92	4.1	5.83	4.1
MIN.	2.0	1.0	-4.47	.58	.00	-2.9	.00	-2.9

```
 REAL RMSE    .85 TRUE SD    1.66  SEPARATION  1.96  PERSON RELIABILITY  .79
MODEL RMSE    .73 TRUE SD    1.72  SEPARATION  2.37  PERSON RELIABILITY  .85
 S.E. OF PERSON MEAN = .13
```

```
MAXIMUM EXTREME SCORE:     15 PERSON
MINIMUM EXTREME SCORE:     29 PERSON
    LACKING RESPONSES:     11 PERSON
```

SUMMARY OF 5 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	650.0	250.8	.00	.10	.99	-.1	1.00	-.1
S.D.	49.1	2.1	.48	.00	.13	1.4	.13	1.3
MAX.	736.0	254.0	.50	.11	1.17	1.7	1.19	1.9
MIN.	592.0	248.0	-.87	.10	.80	-2.2	.81	-2.0

```
 REAL RMSE    .10 TRUE SD     .46  SEPARATION  4.43  ITEM    RELIABILITY  .95
MODEL RMSE    .10 TRUE SD     .47  SEPARATION  4.57  ITEM    RELIABILITY  .95
 S.E. OF ITEM MEAN = .24
```

DELETED: 5 ITEM

Figure 15. Separations and reliabilities of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
 PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
                <more>|
     5         #####  +
                      |
                      |
                      |
                      |
                   #  |
     4                +
                      |
                      |
                      |                             Q153.45
                   .  |
                      |                             Q149.45
                                                    Q155.45
     3               T+
                      |                             Q151.45
                  .#  |
                      |
                  ##  |
                      |
     2                +                             Q152.45
                .###  |
                      |
                 .##  |                    Q153.35
                   .  |                    Q149.35
                 .## S|                    Q155.35
     1                +T
                  .#  |                    Q151.35
                      |
               .####  |S
                   .  |
            ########  |                    Q152.35
     0                +M
                ####  |
                   .  |           Q153.25
                   #  |S          Q149.25
               .#### M|           Q155.25
                   .  |           Q151.25
    -1         .####  +T
                      |
               .####  |
                      |
                   .  |           Q152.25
          .#########  |
    -2             .  +
                      |
                .###  |
                   . S|
                      |  Q153.15
                .###  |  Q149.15
    -3                +  Q155.15
                      |
                      |  Q151.15
                ####  |
                      |
                      |
    -4             .  +  Q152.15
                      |
                      |
                 ### T|
                      |
                      |
    -5    .#########  +
                <less>|
  EACH "#" IS 3. EACH "." IS 1 TO 2
```

Figure 16. Person-item map: Expected score zones (Rasch-half-point thresholds) of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-5    -4    -3    -2    -1     0     1     2     3     4     5
|-----+-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   ITEM
1       1     :       2     :     3    :    4      :    5   5  153  Q153
1      1     :       2     :     3    :    4     :     5    5  149  Q149
1     1     :       2     :     3    :    4      :    5     5  155  Q155
1    1    :       2      :    3    :     4     :    5       5  151  Q151
|                                                           |
|                                                           |
1     :       2     :     3    :    4     :     5           5  152  Q152
|-----+-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   ITEM
-5    -4    -3    -2    -1     0     1     2     3     4     5

2        1   1  1  2  1 1 1  1 2 1       1                  1
7  9  1 121  0 21 281 4 314322 413 4 727 1  6 4   2 1  3    4  PERSON
        S                M               S                T
0 10        20    30 40 50  60 70   80    90              99  PERCENTILE
```
Figure 17. Construct keymap of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
           PERSON - MAP - ITEM
                  <more>|<rare>
    5           #####  +
                       |
                       |
                       |
                       |
                   #   |
    4                  +
                       |
                       |
                       |
                   .   |
                       |
    3                 T+
                       |
                  .#   |
                       |
                  ##   |
                       |
    2                  +
                .###   |
                       |
                 .##   |
                   .   |
                 .## S |
    1                  +T
                  .#   |
                       |
               .####   |S Q153
                   .   |  Q149
            ########   |  Q155
    0                  +M
                ####   |  Q151
                   .   |
                   #   |S
               .#### M |
                   .   |  Q152
   -1          .####   +T
                       |
               .####   |
                       |
                   .   |
          .#########   |
   -2              .   +
                       |
                .###   |
                   . S |
                       |
                .###   |
   -3                  +
                       |
                       |
                ####   |
                       |
                       |
   -4              .   +
                       |
                       |
                 ### T |
                       |
                       |
   -5     .#########   +
                  <less>|<frequ>
 EACH "#" IS 3.  EACH "." IS 1 TO 2
```

Figure 18. Person-item map of the 5-item Accommodation dimension after removal of misfitting items Q154 and Q150, and gender-DIF item Q148

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 26: Finance's work-in-progress figures and tables

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	24.2	100.0%		100.0%
Raw variance explained by measures	=	17.2	71.1%		71.0%
Raw variance explained by persons	=	12.0	49.5%		49.4%
Raw Variance explained by items	=	5.2	21.6%		21.6%
Raw unexplained variance (total)	=	7.0	28.9%	100.0%	29.0%
Unexplned variance in 1st contrast	=	2.3	9.7%	33.4%	
Unexplned variance in 2nd contrast	=	1.3	5.5%	19.1%	
Unexplned variance in 3rd contrast	=	1.1	4.5%	15.4%	
Unexplned variance in 4th contrast	=	.9	3.7%	12.9%	
Unexplned variance in 5th contrast	=	.7	3.0%	10.3%	

Figure 1. Standardized residual variance of initial Finance dimension

STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

CON-TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM
1	.75	1.27	1.15	1.04	A 158	Q158	-.72	-1.26	1.01	.98	a 162	Q162
1	.65	1.14	1.07	.96	B 157	Q157	-.63	-1.00	.80	.84	b 161	Q161
1	.52	1.10	1.50	1.39	C 160	Q160	-.38	-.42	.67	.70	c 156	Q156
							-.14	-.83	.95	.93	D 159	Q159

Figure 2. Residual loadings for items in the first contrast of initial Finance dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

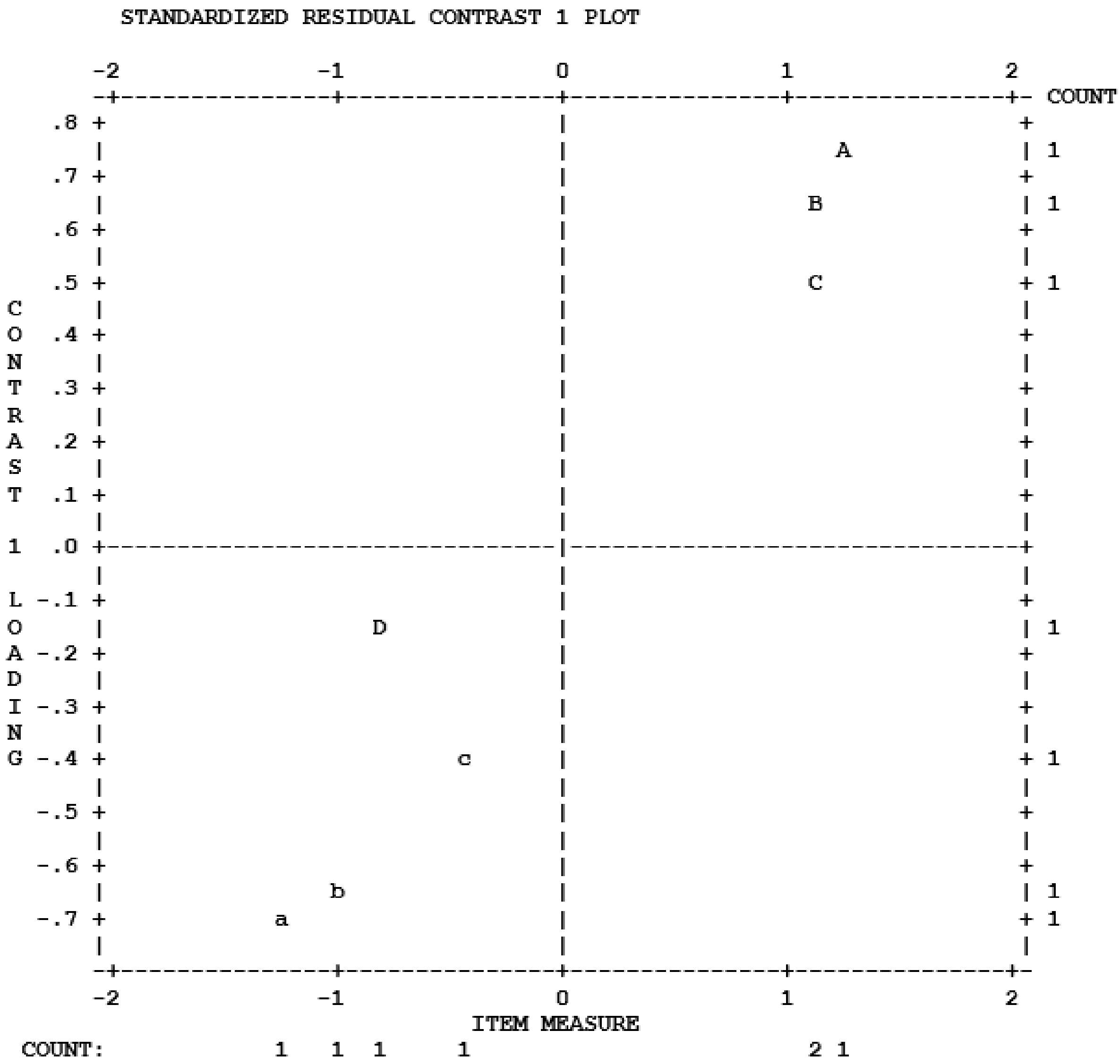

Figure 3. The principal component plot of item loading for the first contrast of the initial Finance dimension

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
156	686	270	.96	.15	1.08	.8	1.14	1.2	A .91	.93	75.3	72.9	Q156
162	755	265	-.76	.14	.93	-.7	.89	-.9	B .95	.94	81.4	71.0	Q162
161	738	269	-.20	.14	.86	-1.4	.79	-1.7	a .94	.94	82.6	73.1	Q161
MEAN	726.3	268.0	.00	.15	.95	-.4	.94	-.5			79.8	72.3	
S.D.	29.4	2.2	.72	.00	.09	.9	.15	1.2			3.2	1.0	

Figure 4. Item Statistics: Misfit Order with point-measure correlation

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
156	686	270	.96	.15	1.08	.8	1.14	1.2	A .91	.92	75.3	72.9	Q156
162	755	265	-.76	.14	.93	-.7	.89	-.9	B .95	.94	81.4	71.0	Q162
161	738	269	-.20	.14	.86	-1.4	.79	-1.7	a .94	.94	82.6	73.1	Q161
MEAN	726.3	268.0	.00	.15	.95	-.4	.94	-.5			79.8	72.3	
S.D.	29.4	2.2	.72	.00	.09	.9	.15	1.2			3.2	1.0	

Figure 5. Item Statistics: Misfit Order with point biserial correlation

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --			Modeled
Total raw variance in observations	=	14.5	100.0%		100.0%
Raw variance explained by measures	=	11.5	79.3%		78.3%
Raw variance explained by persons	=	10.7	74.1%		73.2%
Raw Variance explained by items	=	.7	5.1%		5.1%
Raw unexplained variance (total)	=	3.0	20.7%	100.0%	21.7%
Unexplned variance in 1st contrast	=	1.6	10.8%	52.0%	
Unexplned variance in 2nd contrast	=	1.4	9.9%	47.6%	
Unexplned variance in 3rd contrast	=	.0	.1%	.3%	
Unexplned variance in 4th contrast	=	.0	.0%	.1%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 6. Standardized residual variance

ITEM	ITEM	Correlation
156	161	-0.4872
156	162	-0.5547
161	162	-0.4411

Figure 7. Correlations of residuals for each item pair

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	142	18	-6.86	-7.34	1.44	1.10	NONE	(-8.31)	1
2	2	253	31	-3.74	-3.60	.94	1.06	-7.21	-4.22	2
3	3	193	24	.32	.37	.81	.80	-1.22	.56	3
4	4	128	16	3.67	3.43	.69	.67	2.34	4.22	4
5	5	88	11	5.30	5.61	1.41	1.36	6.09	(7.21)	5
MISSING		10	1	-2.05						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 8. Summary of category structure

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                     55|
B      |            222222                                  5  |
A      |1          2      2                               55   |
B   .8 + 1        2        2                             5     +
I      |  1      2          2       333       4444       5     |
L      |   1    2            2    33   3     4    4     5      |
I      |   1   2             2   3      3   4      4   5       |
T   .6 +    1 2               2  3      3  4        4 5        +
Y      |     12               2 3        3 4        4 5        |
    .5 +     *                 *          *          *         +
O      |     21                32        43          54        |
F   .4 +    2 1               3 2        4 3        5 4        +
       |   2   1             3   2      4   3      5   4       |
R      |   2    1            3    2     4   3      5    4      |
E      |  2      1          3     2    4     3    5     4      |
S   .2 + 2       1         3       2  4       3  5       4     +
P      |2         11      3         24         35         44   |
O      |            1   33         422         53           4  |
N      |             ***1        444   22   555  333         44|
S   .0 +*******************************************************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -9    -7    -5    -3    -1     1     3     5     7     9
        PERSON [MINUS] ITEM MEASURE
```

Figure 9. Category probabilities

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	.96	.17	M	.91	.29	.04	.34	.13	121	.8948	.9419	-.11	156	Q156
F	-.25	.17	M	-.03	.29	-.22	.33	-.65	121	.5142	.0839	-.55	161	Q161
F	-.72	.17	M	-.88	.30	.16	.34	.48	114	.6332	.0856	1.00	162	Q162
M	.91	.29	F	.96	.17	-.04	.34	-.13	121	.8948	.9419	.11	156	Q156
M	-.03	.29	F	-.25	.17	.22	.33	.65	121	.5142	.0839	.55	161	Q161
M	-.88	.30	F	-.72	.17	-.16	.34	-.48	114	.6332	.0856	-1.00	162	Q162

Size of Mantel-Haenszel slice: MHSLICE = .010 logits

Figure 10. Gender Differential Item Functioning

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
            PERSON - MAP - ITEM
                <more>|<rare>
   8          #####  +
                     |
                     |
   7              #  +
                    T|
                     |
   6                 +
                 ##  |
                     |
   5                 +
                     |
             .#####  |
   4                 +
                     |
                     |
   3          .#### S+
                     |
                     |
   2                 +
               .###  |
                     |T
   1              .  +  Q156
            #######  |S
                     |
   0                 +M
                     |  Q161
           .#######  |S Q162
  -1              . M+
                     |T
                     |
  -2           ####  +
                     |
                     |
  -3                 +
                  .  |
                     |
  -4              .  +
      .############  |
                  . S|
  -5                 +
                     |
                     |
  -6                 +
                 .#  |
                     |
  -7              .  +
                     |
                     |
  -8  .############  +
                <less>|<frequ>
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 11. Person-item map

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
                 <more>|
 8           #####  +
                    |
                    |
 7               #  +                               Q156.45
                   T|
                    |
 6                  +                               Q161.45
                ##  |
                    |                               Q162.45
 5                  +
                    |
          .#####    |
 4                  +
                    |
                    |                     Q156.35
 3          .#### S+
                    |
                    |
 2                  +                     Q161.35
            .###    |                     Q162.35
                    |T
 1               .  +
         #######    |S
                    |
 0                  +M
                    |           Q156.25
        .#######    |S
-1               . M+
                    |T          Q161.25
                    |
-2            ####  +           Q162.25
                    |
                    |
-3                  +
                 .  |
                    |
-4               .  +
    .############   |
                 . S|
-5                  +
                    |
                    |
-6                  +
                .#  |  Q156.15
                    |
-7               .  +
                    |  Q161.15
                    |
-8  .############   +  Q162.15
                <less>|
EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 12. Person-item map: Expected score zones (Rasch-half-point thresholds)

SUMMARY OF 221 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	8.1	3.0	-.96	1.32	.89	-.3	.93	-.2
S.D.	2.7	.2	3.85	.31	1.32	1.2	1.38	1.2
MAX.	14.0	3.0	6.90	3.31	9.35	4.1	9.52	4.1
MIN.	2.0	1.0	-7.99	1.08	.00	-1.6	.00	-1.6

REAL RMSE 1.60 TRUE SD 3.50 SEPARATION 2.19 PERSON RELIABILITY .83

MODEL RMSE 1.36 TRUE SD 3.60 SEPARATION 2.65 PERSON RELIABILITY .88

S.E. OF PERSON MEAN = .26

MAXIMUM EXTREME SCORE: 20 PERSON
MINIMUM EXTREME SCORE: 32 PERSON
LACKING RESPONSES: 1 PERSON

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     SUMMARY OF 3 MEASURED (NON-EXTREME) ITEM
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     726.3     268.0         .00     .15       .95    -.4    .94    -.5 |
| S.D.      29.4       2.2         .72     .00       .09     .9    .15    1.2 |
| MAX.     755.0     270.0         .96     .15      1.08     .8   1.14    1.2 |
| MIN.     686.0     265.0        -.76     .14       .86   -1.4    .79   -1.7 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .15 TRUE SD     .70  SEPARATION  4.75  ITEM   RELIABILITY  .96 |
|MODEL RMSE    .15 TRUE SD     .70  SEPARATION  4.81  ITEM   RELIABILITY  .96 |
| S.E. OF ITEM MEAN = .51                                                     |
-------------------------------------------------------------------------------
```

DELETED: 4 ITEM

Figure 13. Summary statistics of (non-extreme) person and (non-extreme) item

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-10  -8    -6    -4    -2     0     2     4     6     8    10
|-----+-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   ITEM
1       1  :        2        :     3    :     4    :   5    5  156  Q156
|                                                           |
|                                                           |
1   1   :        2        :    3    :     4     :  5        5  161  Q161
1  1  :        2        :    3     :    4     :  5          5  162  Q162
|-----+-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   ITEM
-10  -8    -6    -4    -2     0     2     4     6     8    10

 2    1          5      1   3   2  1   1   2            2
 8111 7  2 7    201 1   6  10   81 5   8   1   8   4    0      PERSON
           S              M               S              T
 0 10     20    30 40      50  60 70  80      90       99      PERCENTILE
```

Figure 14. Construct Keymap

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 27: Life Stress' work-in-progress figures and tables

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                                   -- Empirical --    Modeled
Total raw variance in observations     =           21.7 100.0%         100.0%
  Raw variance explained by measures   =           11.7  54.0%          54.1%
    Raw variance explained by persons  =            6.2  28.7%          28.8%
    Raw Variance explained by items    =            5.5  25.2%          25.3%
  Raw unexplained variance (total)     =           10.0  46.0% 100.0%   45.9%
    Unexplned variance in 1st contrast =            2.4  10.8%  23.5%
    Unexplned variance in 2nd contrast =            2.1   9.4%  20.5%
    Unexplned variance in 3rd contrast =            1.2   5.6%  12.2%
    Unexplned variance in 4th contrast =            1.1   5.0%  10.9%
    Unexplned variance in 5th contrast =             .9   4.1%   9.0%
```

Figure 1. Standardized residual variance of initial Life Stress dimension

```
  STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)

------------------------------------------------- ------------------------------------------
|CON-  |       |             INFIT OUTFIT| ENTRY       | |       |             INFIT OUTFIT| ENTRY       |
| TRAST|LOADING|MEASURE   MNSQ MNSQ |NUMBER ITEM | |LOADING|MEASURE   MNSQ MNSQ |NUMBER ITEM |
|------+-------+-------------------+------------| |-------+-------------------+------------|
|  1   |   .77 |     1.43 1.11  .94 |A  171 Q171 | |  -.57 |    -.41  .69  .66 |a  165 Q165 |
|  1   |   .72 |      .56 1.59 1.76 |B  170 Q170 | |  -.56 |   -1.16 1.12 1.22 |b  167 Q167 |
|  1   |   .60 |     1.14 1.27 1.17 |C  172 Q172 | |  -.31 |    -.45  .89  .87 |c  163 Q163 |
|  1   |   .06 |     -.56  .93  .92 |D  168 Q168 | |  -.29 |    -.37  .77  .79 |d  166 Q166 |
|      |       |                    |            | |  -.24 |     .24  .88  .80 |e  164 Q164 |
|      |       |                    |            | |  -.02 |    -.42 1.03 1.10 |E  169 Q169 |
------------------------------------------------- ------------------------------------------
```

Figure 2. Residual loadings for items in the first contrast of initial Life Stress dimension

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
         STANDARDIZED RESIDUAL CONTRAST 1 PLOT

        -2              -1               0               1               2
        -+---------------+---------------+---------------+---------------+-  COUNT
     .8 +                                |                                +
        |                                |                         A      |  1
     .7 +                                |        B                       +  1
        |                                |                                |
     .6 +                                |                  C             +  1
  C     |                                |                                |
  O  .5 +                                |                                +
  N     |                                |                                |
  T  .4 +                                |                                +
  R     |                                |                                |
  A  .3 +                                |                                +
  S     |                                |                                |
  T  .2 +                                |                                +
        |                                |                                |
  1  .1 +                                |                                +
        |                       D        |                                |  1
  L  .0 +-------------------------E------|--------------------------------+  1
  O     |                                |                                |
  A -.1 +                                |                                +
  D     |                                |                                |
  I -.2 +                                |                                +
  N     |                                |   e                            |  1
  G -.3 +                         cd     |                                +  2
        |                                |                                |
    -.4 +                                |                                +
        |                                |                                |
    -.5 +                                |                                +
        |             b           a      |                                |  2
    -.6 +                                |                                +
        -+---------------+---------------+---------------+---------------+-
        -2              -1               0               1               2
                                     ITEM MEASURE
  COUNT:              1          1 31          1    1        1    1
```

Figure 3. The principal component plot of item loading for the first contrast of the initial Life Stress dimension

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     496  61| -3.72 -3.68|  1.06   .96||  NONE   |( -4.89)| 1
|  2   2     225  28| -2.14 -2.12|   .74   .79||  -3.77  |  -1.98 | 2
|  3   3      58   7|  -.57  -.78|   .91   .89||   -.09  |    .43 | 3
|  4   4      17   2|   .47   .50|  1.13  1.18||   1.10  |   2.04 | 4
|  5   5      12   1|   .00* 1.55|  2.46  3.31||   2.77  |(  3.99)| 5
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 4. Category structure of group 1 consisting of items Q170, Q171, and Q172.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                       |
B      |                                                       |
A      |                                                       |
B   .8 +                                                       +
I      |11             2222222                               55|
L      |  1          22       22                            5  |
I      |   11      22           2                          5   |
T   .6 +     1    2              22                       5    +
Y      |      1  2                 2                     5     |
    .5 +       *2                   2          4444444  5      +
O      |      2 1                    2333333  4       4*       |
F   .4 +     2   11                 332     **       55 44     +
       |    2      1              33   2   4  3     5     4    |
R      |  22        1            3      2 4    33  5       44  |
E      |22           11        33        *       35          4 |
S   .2 +               11    33        44 2      533          4+
P      |                 1133         4    22  55   3          |
O      |                333111      44       **      333       |
N      |           33333      11***4     5555  2222     3333   |
S   .0 +************************555******1111111111************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4
        PERSON [MINUS] ITEM MEASURE
```

Figure 5. Category probability curves of group 1 consisting of items Q170, Q171, and Q172.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	496	61	-4.40	-4.26	.89	.87	NONE	(-5.39)	1
2	2	225	28	-2.44	-2.51	.84	.77	-4.28	-2.31	2
3	3	75	9	.04	-.05	1.04	1.05	-.34	2.14	3
5	4	12	1	-.79*	2.43	2.93	2.40	4.61	(5.72)	5

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 6. Category structure of group 1 consisting of items Q170, Q171, and Q172, after combining categories 3 and 4.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                                                             |
B      |                                                             |
A      |1                                     3333333                |
B   .8 + 11               22                33       33             5+
I      |   1           222  222           33           3          55 |
L      |    1        22        22        3              33       5   |
I      |     11     2            2      3                 3     5    |
T   .6 +       1   2              2   33                   3   5     +
Y      |        1 2                2 3                      3 5      |
    .5 +         *                  *                        *       +
O      |        2 1                3 2                      5 3      |
F   .4 +       2   1              3   2                    5   3     +
       |     22     1            3     2                  5     3    |
R      |    2        1          3       22               5       3   |
E      |   2          1        3          2             5         33 |
S   .2 + 22            1     33            2          55            3+
P      |2               11  3               22      55               |
O      |                3**1                 222555                  |
N      |             3333    1111           5555522222               |
S   .0 +*************555555555555***********111111111****************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 7. Category probability curves of group 1 consisting of items Q170, Q171, and Q172, after combining categories 3 and 4.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	496	61	-2.94	-2.87	1.00	.94	NONE	(-4.06)	1
2	2	225	28	-1.27	-1.28	.78	.79	-2.95	-1.11	2
3	3	58	7	.45	.17	.90	.90	.80	1.48	3
4	4	29	4	1.04	1.67	1.56	1.76	2.15	(3.40)	4

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 8. Category structure of group 1 consisting of items Q170, Q171, and Q172, after combining categories 4 and 5.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                       |
B      |1                                                      |
A      | 11                                                  44|
B   .8 +   11                                              44  +
I      |     11             22222222                      4    |
L      |       1          22        22                  44     |
I      |        11      22            2                4       |
T   .6 +          1    2               2              4        +
Y      |           1  2                 2            4         |
    .5 +            *2                   22  33333  4          +
O      |           2 1                     *3     3*           |
F   .4 +          2   11                 33 2     4 33         +
       |        22      1               3    2   4    3        |
R      |       2         1            33      2 4      33      |
E      |     22           11        33         *         33    |
S   .2 +    2               11     3         44 2          33  +
P      | 222                  11333         4    22          33|
O      |2                     33111       44       22          |
N      |                333333     11***44           2222      |
S   .0 +****************4444444444444   11111111111111111******+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4
        PERSON [MINUS] ITEM MEASURE
```

Figure 9. Category probability curves of group 1 consisting of items Q170, Q171, and Q172, after combining categories 4 and 5.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	496	61	-5.20	-5.09	.91	.79	NONE	(-5.89)	1
2	2	283	35	-2.09	-2.14	.86	.84	-4.79	-1.48	2
4	3	17	2	.30	.12	.90	.81	1.85	2.39	4
5	4	12	1	.26*	2.21	2.05	5.08	2.94	(4.23)	5

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 10. Category structure of group 1 consisting of items Q170, Q171, and Q172, after combining categories 2 and 3.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+---------+---------+---------+---------+---------+---------+-
R  1.0 +                                                             +
O      |                     2222                                 555|
B      |                 2222    2222                          555   |
A      |              222          222                      55      |
B   .8 +             2                  2                   5        +
I      |11         22                    2                 5         |
L      |  1       2                       2               5          |
I      |   1     2                         2             5           |
T   .6 +    1   2                           2           5            +
Y      |     1 2                             2         5             |
    .5 +      *                               2       5              +
O      |     2 1                               2444445               |
F   .4 +    2   1                             442   544              +
       |   2     1                           4  2  5   4             |
R      |  2       1                        44    25     44           |
E      |22         11                      4       *       4          |
S   .2 +             1                  44       5 2       44        +
P      |              11              44       55   22       44      |
O      |                111        444       55       22       444   |
N      |                   111***44       555           222       444|
S   .0 +**********************555*********111111111111111************+
E      -+---------+---------+---------+---------+---------+---------+-
       -6        -4        -2         0         2         4         6
        PERSON [MINUS] ITEM MEASURE
```

Figure 11. Category probability curves of group 1 consisting of items Q170, Q171, and Q172, after combining categories 2 and 3.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
172	405	270	.18	.18	1.19	1.4	1.13	1.0	A .86	.88	66.7	72.6	Q172
170	442	269	-1.01	.18	1.16	1.4	1.18	1.5	B .87	.89	68.9	68.0	Q170
171	384	269	.83	.19	.60	-3.6	.57	-3.7	a .91	.86	87.1	72.1	Q171
MEAN	410.3	269.3	.00	.18	.98	-.3	.96	-.4			74.2	70.9	
S.D.	24.0	.5	.76	.00	.27	2.4	.27	2.3			9.2	2.1	

Figure 12. Item statistics of group 1 consisting of items Q170, Q171, and Q172, after combining categories 2 and 3.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     SUMMARY OF 131 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT          OUTFIT    |
|          SCORE      COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-------------------------------------------------------------------------------|
| MEAN       4.2        2.0       -1.80    1.43       .97    -.3    .98    -.2 |
| S.D.        .9         .0        1.68     .06      1.54    1.2   1.55    1.2 |
| MAX.       7.0        2.0        1.99    1.60      9.90    4.7   9.90    4.7 |
| MIN.       3.0        2.0       -4.06    1.36       .06   -1.1    .06   -1.1 |
|-------------------------------------------------------------------------------|
| REAL RMSE   1.78 TRUE SD     .00  SEPARATION   .00  PERSON RELIABILITY  .00 |
|MODEL RMSE   1.43 TRUE SD     .87  SEPARATION   .61  PERSON RELIABILITY  .27 |
| S.E. OF PERSON MEAN = .15                                                     |
-------------------------------------------------------------------------------
  MAXIMUM EXTREME SCORE:       3 PERSON
  MINIMUM EXTREME SCORE:     136 PERSON
      LACKING RESPONSES:       4 PERSON
```

Figure 13. Person separation and reliability of group 1 consisting of items Q170 and Q172 after combining categories 2 and 3 and removing item Q171.

```
     SUMMARY OF 132 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT          OUTFIT    |
|          SCORE      COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-------------------------------------------------------------------------------|
| MEAN       5.9        3.0       -2.42    1.21       .96    -.2    .96    -.2 |
| S.D.       1.3         .0        1.87     .07      1.28    1.3   1.32    1.3 |
| MAX.       9.0        3.0        2.13    1.41      8.92    3.8   9.25    3.9 |
| MIN.       4.0        3.0       -5.09    1.15       .08   -1.3    .08   -1.3 |
|-------------------------------------------------------------------------------|
| REAL RMSE   1.44 TRUE SD    1.19  SEPARATION   .82  PERSON RELIABILITY  .40 |
|MODEL RMSE   1.21 TRUE SD    1.43  SEPARATION  1.18  PERSON RELIABILITY  .58 |
| S.E. OF PERSON MEAN = .16                                                     |
-------------------------------------------------------------------------------
  MAXIMUM EXTREME SCORE:       3 PERSON
  MINIMUM EXTREME SCORE:     135 PERSON
      LACKING RESPONSES:       4 PERSON
```

Figure 14. Person separation and reliability of group 1 consisting of items Q170, Q171, and Q172 after combining categories 2 and 3.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1      152  28| -5.65 -5.94|  1.28  1.09||  NONE   |( -7.51)| 1
|  2   2      210  39| -3.38 -3.27|   .98   .95||  -6.41  |  -3.61 | 2
|  3   3      107  20|   .42   .39|   .69   .71||   -.80  |   1.01 | 3
|  4   4       34   6|  3.31  2.84|   .81   .86||   2.88  |   3.62 | 4
|  5   5       37   7|  4.22  4.64|  1.51  1.66||   4.33  |(  5.58)| 5
|-------------------+------------+------------++---------+--------|
|MISSING        4   1| -4.66      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 15. Category structure of group 2 consisting of items Q165 and Q167

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-------+-------+-------+-------+-------+-------+-------+-
R  1.0 +                                                         +
O      |                                                         |
B      |                2222                                     |
A      |1            222    222                                 5|
B   .8 + 1          2          2                               5 +
I      |  1        2            2         33333               5  |
L      |   1      2              2       3     3             5   |
I      |    1    2                2     3       3           5    |
T   .6 +     1  2                  2   3         3         5     +
Y      |     1 2                    2 3           3        5     |
    .5 +      *                      *             3 4444 5      +
O      |     2 1                    32             34    *       |
F   .4 +     2  1                  3  2            43    54      +
       |    2    1                3    2          4  3  5  44    |
R      |   2      1              3      2        4   3 5     4   |
E      |  2        1            3        2     44     *       4  |
S   .2 + 2          1          3          2   4       53       4 +
P      |2            11       3            2 4       5  3       4|
O      |               11  333             4*2     55    33      |
N      |               33**11          4444   22**5        333   |
S   .0 +****************************************11***************+
E      -+-------+-------+-------+-------+-------+-------+-------+-
       -8      -6      -4      -2       0       2       4       6
        PERSON [MINUS] ITEM MEASURE
```

Figure 16. Category probability curves of group 2 consisting of items Q165 and Q167

```
    SUMMARY OF 205 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN       4.9       2.0       -1.69    1.58        .91    -.3    .93    -.2 |
| S.D.       1.6        .1        3.06     .32       1.73    1.1   1.77    1.1 |
| MAX.       9.0       2.0        5.02    3.04       9.68    3.8   9.90    3.7 |
| MIN.       2.0       1.0       -6.43    1.13        .00   -2.1    .00   -1.7 |
|-----------------------------------------------------------------------------|
| REAL RMSE   1.98 TRUE SD    2.34  SEPARATION  1.18  PERSON RELIABILITY  .58 |
|MODEL RMSE   1.61 TRUE SD    2.61  SEPARATION  1.62  PERSON RELIABILITY  .72 |
| S.E. OF PERSON MEAN = .21                                                   |
-------------------------------------------------------------------------------
  MAXIMUM EXTREME SCORE:      9 PERSON
  MINIMUM EXTREME SCORE:     58 PERSON
      LACKING RESPONSES:      2 PERSON
```

Figure 17. Person separation and reliability of group 2 consisting of items Q165 and Q167

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
           PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
              <more>|
   6            .#  +
                    |                             Q165.45
                    |
                    |
   5             #  +
                    |
                   T|
                    |
   4                +
                .#  |                    Q165.35
                    |                             Q167.45
                    |
   3                +
                    |
                    |
               .##  |T
   2                +
                    |
                    |                    Q167.35
                   S|
   1         .####  +S
                    |
                    |           Q165.25
   0             .  +M
                    |
                    |
                    |
  -1         .####  +S
                    |
                    |
                   M|
  -2                +           Q167.25
                    |T
                    |
                    |
  -3                +
                    |
     .############  |
                    |
  -4                +
                    |
                    |
                 . S|
  -5                +
                    |  Q165.15
                    |
                    |
  -6                +
                    |
               ###  |
                    |
  -7                +
                    |
                    |  Q167.15
                   T|
  -8     .########  +
              <less>|
EACH "#" IS 7. EACH "." IS 1 TO 6
```

Figure 18. Person-item map: Expected score zones (Rasch-half-point thresholds), of group 2 consisting of items Q165 and Q167

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1     473  36| -3.21 -3.23|  1.23  1.04||  NONE   |( -4.27)| 1
|  2   2     498  38| -1.60 -1.57|   .82   .84||   -3.14 |  -1.66 | 2
|  3   3     218  17|  -.27  -.28|   .98  1.02||    -.07 |    .44 | 3
|  4   4      77   6|   .80   .67|   .83   .81||    1.25 |   1.75 | 4
|  5   5      45   3|  1.23  1.38|  1.20  1.27||    1.95 |(  3.32)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      33   2| -2.24      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

Figure 19. Category structure of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169.

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                       +
O      |                                                       |
B      |                                                      5|
A      |11                                                  55 |
B   .8 +  11                                              55   +
I      |    11                                           5     |
L      |      1           22222                         5      |
I      |       1        22     22                      5       |
T   .6 +        11    22         22                   5        +
Y      |          1  2             2                 5         |
    .5 +           *2               2               5          +
O      |          2 1                2333333       5           |
F   .4 +         2   1              332     33 444*            +
       |       22     11           3   2     4*  5 444         |
R      |      2         1        33     2  44  35     44       |
E      |    22           1      3        24    53       4      |
S   .2 +  22              11  33        4422  5  33      44    +
P      |22                  **         4    25     3       444 |
O      |                 333  111   444    5522     33        4|
N      |            33333       4***1  5555    222    3333     |
S   .0 +************************55555**1111111111**************+
E      -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
       -5    -4    -3    -2    -1     0     1     2     3     4
        PERSON [MINUS] ITEM MEASURE
```

Figure 20. Category probability curves of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	473	36	-3.40	-3.39	1.06	1.06	NONE	(-4.39)	1
2	2	498	38	-1.62	-1.60	.84	.83	-3.26	-1.71	2
3	3	295	23	.33	.26	.98	1.01	-.16	1.64	3
5	4	45	3	1.68	2.00	1.27	1.22	3.42	(4.54)	5
MISSING		33	2	-2.26						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 21. Category structure of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

```
        CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P     -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
R  1.0 +                                                           +
O      |                                                           |
B      |                                                           |
A      |11                                                        5|
B   .8 +  1                                                     55 +
I      |   11                               333333             5   |
L      |     1           222222           33      333         55   |
I      |      11        22      22       33           3       5     |
T   .6 +        1    22          22    3              33    5      +
Y      |         1  2             2   3                 3  5       |
    .5 +          12               2*3                   35        +
O      |         221               3 2                  5533       |
F   .4 +        2   11            3   2                5    3      +
       |       2      1          3     22             5      3     |
R      |     22        1       33        2           5        33   |
E      |    2           11    3           2        55          3   |
S   .2 +  22             1  33               22    55             33 +
P      |22                **                2255                 3|
O      |                333  111            555222                 |
N      |           33333       11111   55555      22222            |
S   .0 +**********555555555555555555***111111111111111*************+
E     -+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-
      -5    -4    -3    -2    -1     0     1     2     3     4     5
        PERSON [MINUS] ITEM MEASURE
```

Figure 22. Category probability curves of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)					
		-- Empirical --			Modeled
Total raw variance in observations	=	10.7	100.0%		100.0%
Raw variance explained by measures	=	5.7	53.2%		53.1%
Raw variance explained by persons	=	4.2	38.9%		38.8%
Raw Variance explained by items	=	1.5	14.4%		14.3%
Raw unexplained variance (total)	=	5.0	46.8%	100.0%	46.9%
Unexplned variance in 1st contrast	=	2.0	19.0%	40.7%	
Unexplned variance in 2nd contrast	=	1.4	12.7%	27.2%	
Unexplned variance in 3rd contrast	=	.8	7.9%	16.9%	
Unexplned variance in 4th contrast	=	.8	7.1%	15.2%	
Unexplned variance in 5th contrast	=	.0	.0%	.1%	

Figure 23. Standardized residual variance of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
164	470	266	.85	.13	1.09	.9	1.07	.7	A .78	.78	70.8	66.6	Q164
169	519	262	-.10	.13	1.08	.8	1.08	.9	B .81	.82	63.5	64.3	Q169
168	538	260	-.47	.13	1.06	.6	1.05	.5	C .81	.83	69.5	63.3	Q168
163	531	259	-.26	.13	1.02	.2	1.01	.1	b .82	.82	69.7	63.7	Q163
166	521	264	-.03	.13	.75	-2.9	.75	-2.9	a .86	.82	73.4	64.7	Q166
MEAN	515.8	262.2	.00	.13	1.00	-.1	.99	-.1			69.4	64.5	
S.D.	23.9	2.6	.45	.00	.13	1.4	.13	1.4			3.2	1.1	

Figure 24. Item statistics of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)					
		-- Empirical --			Modeled
Total raw variance in observations	=	8.3	100.0%		100.0%
Raw variance explained by measures	=	4.3	52.0%		51.8%
Raw variance explained by persons	=	3.0	36.4%		36.3%
Raw Variance explained by items	=	1.3	15.5%		15.5%
Raw unexplained variance (total)	=	4.0	48.0%	100.0%	48.2%
Unexplned variance in 1st contrast	=	2.1	24.7%	51.3%	
Unexplned variance in 2nd contrast	=	1.1	13.5%	28.2%	
Unexplned variance in 3rd contrast	=	.8	9.8%	20.4%	
Unexplned variance in 4th contrast	=	.0	.0%	.1%	
Unexplned variance in 5th contrast	=	.0	.0%	.0%	

Figure 25. Standardized residual variance of group 3 consisting of items Q163, Q164, Q168, and Q169 after combining categories 3 and 4, and deleting item Q166

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

DIF class specification is: DIF=@GENDER

PERSON CLASS	DIF MEASURE	DIF S.E.	PERSON CLASS	DIF MEASURE	DIF S.E.	DIF CONTRAST	JOINT S.E.	t	Welch d.f.	Prob.	MantelHanzl Prob.	Size	ITEM Number	Name
F	-.26	.15	M	-.28	.26	.02	.30	.07	110	.9422	.6319	.22	163	Q163
F	.85	.15	M	.89	.28	-.04	.32	-.12	108	.9055	.8679	-.26	164	Q164
F	-.03	.15	M	-.07	.26	.04	.30	.13	110	.8990	.4350	.09	166	Q166
F	-.49	.15	M	-.39	.27	-.09	.30	-.31	105	.7556	.9098	-.08	168	Q168
F	-.10	.15	M	-.14	.27	.04	.30	.12	107	.9063	.8219	.27	169	Q169

Figure 26. Gender Differential Item Functioning of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
        PERSON - MAP - ITEM
            <more>|<rare>
 5             .  +
                  |
                  |
                  |
                  |
                  |
 4                +
               .  |
                  |
                  |
                  |
               .  |
 3                +
                  |
                  |
                  |
              .# T|
                  |
 2                +
                  |
            .###  |
                  |
                  |
                  |
 1                +
             .##  |T Q164
               .  |
                 S|S
                  |
            ####  |
 0                +M Q166
               .  |  Q169
               .  |  Q163
        .#######  |S Q168
                  |
               .  |T
-1        .#####  +
                  |
                 M|
                  |
       .########  |
                  |
-2                +
          .#####  |
               .  |
               .  |
                  |
-3          ####  +
                  |
               . S|
               .  |
               .  |
           .####  |
-4                +
                  |
                  |
               .  |
            ####  |
                  |
-5 .############  +
            <less>|<frequ>
EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 26. Person-item map of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
PERSON - MAP - ITEM - Expected score zones (Rasch-half-point thresholds)
                <more>|
     5              . +
                      |
                      |
                      |
                      |                     Q164.45
                      |
     4                +
                    . |
                      |
                      |                     Q166.45
                      |                     Q169.45
                    . |                     Q163.45
     3                +                     Q168.45
                      |
                      |
                      |
                   .# T|
                      |
     2                +
                 .### |
                      |
                      |
                      |
     1                +
                  .## |T
                    . |           Q164.25
                     S|S
                      |
                 #### |
     0                +M
                    . |           Q166.25
                      |           Q169.25
                    . |           Q163.25
             .####### |S
                      |           Q168.25
                    . |T
    -1         .##### +
                      |
                     M|
                      |
            .######## |
                      |
    -2                +
               .##### |
                    . |  Q164.15
                    . |
                      |
    -3           #### +
                      |
                    . S|  Q166.15
                    . |  Q169.15
                    . |  Q163.15
                .#### |  Q168.15
    -4                +
                      |
                      |
                    . |
                 #### |
                      |
    -5  .############ +
                <less>|
 EACH "#" IS 4. EACH "." IS 1 TO 3
```

Figure 27. Person-item map: Expected score zones (Rasch-half-point thresholds), of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
     SUMMARY OF 219 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE      COUNT     MEASURE  ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN      10.4        4.8      -1.41     .87       .98    -.3    .98    -.3 |
| S.D.       3.3         .5       1.89     .13      1.10    1.5   1.12    1.5 |
| MAX.      22.0        5.0       3.89    1.82      7.65    4.9   7.71    5.0 |
| MIN.       2.0        1.0      -4.72     .79       .00   -2.5    .00   -2.5 |
|-----------------------------------------------------------------------------|
| REAL RMSE   1.00 TRUE SD    1.60  SEPARATION  1.60  PERSON RELIABILITY  .72 |
|MODEL RMSE    .88 TRUE SD    1.68  SEPARATION  1.91  PERSON RELIABILITY  .78 |
| S.E. OF PERSON MEAN = .13                                                   |
-------------------------------------------------------------------------------
  MAXIMUM EXTREME SCORE:      3 PERSON
  MINIMUM EXTREME SCORE:     49 PERSON
      LACKING RESPONSES:      3 PERSON

     SUMMARY OF 5 MEASURED (NON-EXTREME) ITEM
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT    |
|          SCORE      COUNT     MEASURE  ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     515.8      262.2        .00     .13      1.00    -.1    .99    -.1 |
| S.D.      23.9        2.6        .45     .00       .13    1.4    .13    1.4 |
| MAX.     538.0      266.0        .85     .13      1.09     .9   1.08     .9 |
| MIN.     470.0      259.0       -.47     .13       .75   -2.9    .75   -2.9 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .13 TRUE SD     .43  SEPARATION  3.28  ITEM   RELIABILITY  .92 |
|MODEL RMSE    .13 TRUE SD     .43  SEPARATION  3.37  ITEM   RELIABILITY  .92 |
| S.E. OF ITEM MEAN = .23                                                     |
-------------------------------------------------------------------------------
```

DELETED: 0 ITEM

Figure 28. Separations and reliabilities of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

ITEM	ITEM	Correlation
163	168	-0.5566
164	168	-0.4772
164	169	-0.4634
163	166	-0.3799
166	169	-0.2866
163	169	-0.2735
164	166	-0.2283
168	169	-0.0376
166	168	0.0569
163	164	0.1659

Figure 29. Correlations of residuals for each item pair of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

```
EXPECTED SCORE: MEAN  (Rasch-score-point threshold, ":" indicates Rasch-half-point threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-5       -3        -1         1         3         5         7
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
1      1    :        2       :       3         :    5       5  164  Q164
|                                                           |
|                                                           |
1  1    :       2       :        3        :     5           5  166  Q166
1  1    :       2       :        3        :    5            5  169  Q169
1 1    :       2       :        3        :    5             5  163  Q163
11    :       2       :        3        :    5              5  168  Q168
|---------+---------+---------+---------+---------+---------|  NUM   ITEM
-5       -3        -1         1         3         5         7

41    1   1  2  3   2  3  1  1   1
8512  72216 23  13  22 1 16  0   4   7   1  1           3      PERSON
 S            M            S            T
0 20 30     40 50 60  80    90                         99      PERCENTILE
```
Figure 30. Construct Keymap

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBISERL-AL CORR.	PTBISERL-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
164	470	266	.85	.13	1.09	.9	1.07	.7	A .76	.77	70.8	66.6	Q164
169	519	262	-.10	.13	1.08	.8	1.08	.9	B .78	.81	63.5	64.3	Q169
168	538	260	-.47	.13	1.06	.6	1.05	.5	C .81	.82	69.5	63.3	Q168
163	531	259	-.26	.13	1.02	.2	1.01	.1	b .82	.81	69.7	63.7	Q163
166	521	264	-.03	.13	.75	-2.9	.75	-2.9	a .85	.80	73.4	64.7	Q166
MEAN	515.8	262.2	.00	.13	1.00	-.1	.99	-.1			69.4	64.5	
S.D.	23.9	2.6	.45	.00	.13	1.4	.13	1.4			3.2	1.1	

Figure 31. Item statistics of group 3 consisting of items Q163, Q164, Q166, Q168, and Q169 after combining categories 3 and 4, showing point biserial correlations

SUMMARY OF 214 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	8.4	3.9	-1.31	.95	.98	-.3	.98	-.3
S.D.	2.6	.4	1.81	.11	1.17	1.4	1.18	1.4
MAX.	17.0	4.0	3.46	1.80	8.09	5.0	8.10	5.0
MIN.	2.0	1.0	-4.39	.88	.00	-2.1	.00	-2.1

REAL RMSE 1.11 TRUE SD 1.43 SEPARATION 1.29 PERSON RELIABILITY .62
MODEL RMSE .96 TRUE SD 1.54 SEPARATION 1.60 PERSON RELIABILITY .72
S.E. OF PERSON MEAN = .12

MAXIMUM EXTREME SCORE: 3 PERSON
MINIMUM EXTREME SCORE: 54 PERSON
LACKING RESPONSES: 3 PERSON

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

SUMMARY OF 4 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	514.5	261.8	.00	.13	1.00	.0	.99	-.1
S.D.	26.6	2.7	.50	.00	.09	.9	.09	1.0
MAX.	538.0	266.0	.84	.13	1.12	1.3	1.12	1.3
MIN.	470.0	259.0	-.47	.13	.88	-1.3	.87	-1.4

REAL RMSE .13 TRUE SD .48 SEPARATION 3.71 ITEM RELIABILITY .93
MODEL RMSE .13 TRUE SD .48 SEPARATION 3.78 ITEM RELIABILITY .93
S.E. OF ITEM MEAN = .29

Figure 32. Separations and reliabilites of group 3 consisting of items Q163, Q164, Q168, and Q169 after combining categories 3 and 4 and removing item Q166

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 28: Consent Form and Information Sheet for Participants

<u>Consent Form and Information Sheet for Participants</u>

THE EDUCATION UNIVERSITY OF HONG KONG
Department of Psychology

CONSENT TO PARTICIPATE IN RESEARCH

Development and validation of the Acculturative Stress Scale for mainland Chinese undergraduate students in Hong Kong (ASSMCUS) using Rasch analysis

I ____________________ hereby consent to participate in the captioned research supervised by Professor Wang, Wen Chung and conducted by Mr Cheung, Patrick who is a doctoral student of Department of Psychology in The Education University of Hong Kong.

I understand that information obtained from this research may be used in future research and may be published. However, my right to privacy will be retained, i.e., my personal details will not be revealed.

The procedure as set out in the **<u>attached</u>** information sheet has been fully explained. I understand the benefits and risks involved. My participation in the project is voluntary.

I acknowledge that I have the right to question any part of the procedure and can withdraw at any time without negative consequences.

Name of participant ______________________________

Signature of participant ______________________________

Date ______________________________

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

INFORMATION SHEET
(for interview)

Development and validation of the Acculturative Stress Scale for mainland Chinese undergraduate students in Hong Kong (ASSMCUS) using Rasch analysis

You are invited to participate in a project supervised by Professor Wang, Wen Chung and conducted by Mr Cheung, Patrick who is a doctoral student of the Department of Psychology in The Education University of Hong Kong.

The aim of this study is to develop and validate a scale to measure the acculturative stress experienced by mainland Chinese students pursuing undergraduate studies in Hong Kong. As a mainland Chinese undergraduate student in Hong Kong's tertiary institutions, you are cordially invited to participate in this study, which requires 14 interviewees.

Since your sharing of acculturation experiences with interviewer is valuable and crucial to the success of this study, it is hoped that your responses are frank and honest. The time taken is only about 1 hour. The findings of this study can enhance our understanding of the difficulties faced by the mainland Chinese undergraduate students in their course of study in Hong Kong, and allow us to use a new instrument to assess their level of acculturative stress. To thank for your time and effort in this study, either a meal or HK$40 will be given to you.

Since the interview does not involve any personal sensitive data, there should be no risk to you. Moreover, your participation in the project is voluntary. You have every right to withdraw from the study at any time without negative consequences. All information related to you will remain confidential, and will be identifiable by codes known only to the researcher.

The results of this study will be disseminated in the form of thesis, and probable journal article.

If you would like to obtain more information about this study, please contact me at email address: [redacted] or his supervisor Professor Wang at email address: wcwang@eduhk.hk

If you have any concerns about the conduct of this research study, please do not hesitate to contact the Human Research Ethics Committee by email at hrec@eduhk.hk or by mail to Research and Development Office, The Education University of Hong Kong.

Thank you for your interest in participating in this study.

Mr Cheung, Patrick
Principal Investigator

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 29: Tacit Consent and Information to Online Survey Participants

本人是香港教育大学的博士生，现正进行一项关于内地本科生在香港求学的学术研究，目的是开发一个量表用来量度内地生在香港攻读本科时所面对的压力。

此项研究需要您完成一份不记名问卷, 内容关于您在适应香港生活和学习过程中所遇到的压力，您对生活的满意程度和您的情绪状况，完成本问卷大约需要十分钟，您真诚的回答是这次研究的成功关键。

近年有很多内地同学在香港攻读本科课程, 您对问卷所提供的数据将有助了解您们的情况, 亦可帮助以后来港的内地同学更好地适应在港的生活和学习, 应对压力, 从而顺利完成课程。

参与此次研究纯属自愿, 您回答问卷的数据绝对保密, 只作研究用途。如您对此项研究有任何疑问, 请发送电子邮件至 [redacted] 联系本人 Patrick Cheung 或 wcwang@eduhk.hk 联系我的指导老师 Prof Wen-chung Wang 。如欲询问有关参与研究人仕的保障权益, 请发送电子邮件至 hrec@eduhk.hk 联系香港教育大学人类实验对象操守委员会 (Ref. no. 2016—2017—0289)。

此问卷共有五部份，成功完成后，您可填写联系途径，参与抽奖活动，赢取 1 张价值 HK$50 的百佳超市礼券，有 100 张供抽取。 获奖者是用一个随机数生成器来选择，抽奖结果在 2018 年 6 月份内通过电子邮件通知参与人仕。

感谢您参与此次研究。祝愿您在香港的求学和生活一切安好。

通过回答本问卷，您确认以下内容：
- 您已经阅读上述信息,
- 您自愿同意参与此项研究,
- 您是现正在香港攻读本科的内地生。

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 30: Individual Interview Guide

你为什么选择在香港学习？
Why did you choose to study in Hong Kong?

欢於香港的教育, 你有什么喜欢和不喜欢的东西？
What do you like and dislike about the Hong Kong's education?

在你的大学生活，有没有遇到什么问题或困难？
Did you encounter any problems or difficulties in your university life in Hong Kong?

在香港的生活, 你需要適应或调整吗？
Did you need to make any adaptations and adjustments to your life in Hong Kong?

你如何度过休闲时间？
How did you spend your leisure time?

你与香港人有多少互动？
How much interaction do you have with Hong Kong people?

你有没有遇到任何歧视？
Did you encounter any discrimination?

毕业后, 你的计划是什么？
What is your plan after graduation?

During each interview, I will ask additional questions according to each participant's response.

Also, the participants will glance through the item pool in the Appendix 9 to see if some items specially appeal to them.

In addition, the participants are asked to suggest if there is any item to be added to, removed from, or amended in the item pool.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 31: Focus Group Interview Guide

Before the focus group interview is held, each participant is requested to fill out a survey containing the tentative 172-item ASSMCUS, criteria measurements, overall remarks, and demography.

After about thirty minutes, they will get together to form a group and comment on the organization and content of the survey, especially the tentative 172-item ASSMCUS.

During the focus group interview, participants will be asked the following questions. Further questions may also be asked depending on the responses of participants.

您对问卷的整体意见或看法是甚么？
What are your general comments or views on the survey, especially the tentative 172-item ASSMCUS?

哪个问题让你感到困惑或不清楚？
Which question makes you feel confused or is unclear to you?

在词典，语法和语义方面可以改进哪个问题？
Which question can be improved in terms of diction, grammar, and semantics?

Subsequently, each item in the ASSMCUS will go through with all participants to see if there are any further comments.

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.

Appendix 32: ASSMCUS (online form as at 27 Aug 2018)


中国内地本科生跨文化适应的压力调查

目前页数 1 总页数 6 - 简介

17%

简介

本人是香港教育大学的博士生。现正进行一项关于内地本科生在香港求学的学术研究,目的是开发一个量表用来量度内地生在香港攻读本科时所面对的压力。

此项研究需要您完成一份不记名问卷,内容关于您在适应香港生活和学习过程中所遇到的压力,您对生活的满意程度和您的情绪状况。完成本问卷大约需要十分钟,您真诚的回答是这次研究的成功关键。

继续

The Education University of Hong Kong Library
For private study or research only.
Not for publication or further reproduction.