Running Head: RESOURCE LOSS, RESOURCE GAIN

Resource Loss, Resource Gain, and Psychological Resilience and Dysfunction Following Cancer Diagnosis: A Growth Mixture Modeling Approach

Wai Kai Hou, PhD[1,2]; Chi Ching Law, MD[3]; Jing Yin, PhD[2]; Yiu Tung Fu, MD[3]

[1] Department of Psychological Studies, The Hong Kong Institute of Education, Hong Kong

[2] Centre of Buddhist Studies, Social Neuroscience Research Network, The University of Hong Kong, Hong Kong

[3] Department of Clinical Oncology, Queen Elizabeth Hospital, Hong Kong

Cite: Hou, W. K., Law, C. C., Yin, J., & Fu, Y. T. (2010). Resource loss, resource gain, and psychological resilience and dysfunction following cancer diagnosis: A growth mixture modeling approach. *Health Psychology*, *29*, 484-495

Address for Correspondence:

Wai Kai Hou

Department of Psychological Studies

Hong Kong Institute of Education

10 Lo Ping Road, Tai Po, New Territories

Hong Kong

Email: wkhou@ied.edu.hk

Abstract

Objective: This study investigated trajectories of psychological distress and their relationships with change in psychosocial resources in the year following cancer diagnosis. ***Design:*** Chinese colorectal cancer (CRC) patients (n = 234) were assessed within 12 weeks of diagnosis (T1) and again at three-month (T2) and 12-month (T3) follow-ups. Growth mixture modeling was used to analyze the longitudinal data. ***Main Outcome Measures:*** Psychological distress was measured at the three time-points using Hospital Anxiety and Depression Scale (HADS). ***Results:*** Growth mixture models identified four classes: *chronic distress* (7-9%), *delayed distress* (10-13%), *recovery* (13-16%), and *resilient* (65-67%). People in *chronic distress* were more likely to demonstrate loss in physical functioning and social relational quality than those in *delayed distress*, and loss in physical functioning, optimism, and hope than those in *recovery*, but more likely to demonstrate stability/gain in social support than those in *delayed distress* and *resilient*. People in *resilient* were more likely to report stability/gain in optimistic personalities than those in *delayed distress* but not those in *recovery*. ***Conclusion:*** Understanding differential outcome trajectories and associated change in coping resources has implications for developing on-going psychological services for cancer patients during the diagnosis and treatment process.

Keywords: Resource change; Trajectories of Psychological Distress; Resilience; Colorectal Cancer

There has been a recent surge of interest in studying psychological resilience in adaptation to cancer, so as to promote well-being as well as minimize risk of poor adjustment (Aspinwall & MacNamara, 2005; Coughlin, 2008). Resilience denotes maintenance of healthy levels of psychological functioning in the face of highly disruptive or life-threatening events, not only at a single point in time but also as a stable trajectory across time despite transient perturbations (Bonanno, 2004; Staudinger, Marsiske, & Baltes, 1995). Healthy functioning may manifest in an absence of psychopathology such as depressive symptoms or a presence of psychological well-being such as positive emotions. Conventional psycho-oncological studies have been focusing on investigating impact and correlates of pathological experiences. Currently, very little is known about alternative patterns of psychological functioning in cancer patients, let alone specific investigations of resilience.

Compared with the cancer literature, a growing body of research has investigated psychological resilience and other adaptation trajectories following traumatic life events. Four heterogeneous trajectories consistently emerge in the first and second year after bereavement (Bonanno et al., 2002; Bonanno, Wortman, & Nesse, 2004), terrorist attack (Bonanno, Galea, Bucciarelli, & Vlahov, 2006, 2007), and natural disasters (Norris, Tracy, & Galea, 2009). Among these populations, the majority (35-55%) follows a *resilient* trajectory, characterized by enduring normative psychological functioning (i.e., below a cutoff score of clinically significant distress). Sizable portions of people (10-35%) exhibit respectively *chronic distress*, characterized by persistently higher levels of distress (i.e., above the cutoff), or *recovery*, characterized by a change from initial higher levels to normative levels of distress. The rarest trajectory is *delayed distress* (≤ 10%), characterized by initially normative functioning followed by a rise to higher levels of distress. Bonanno et al. (2008) have recently identified these trajectories in 997 Hong Kong Chinese in the 18 months following aggressive treatment in isolation wards for severe acute respiratory syndrome (SARS), a highly life-threatening infectious disease, suggesting the utility of the four trajectories in

explaining adaptation after traumatic medical experiences.

Caution nevertheless is warranted in applying the trajectories to describe cancer patients due to marked differences between cancer process and traumatic life events (Kangas, Henry, & Bryant, 2002; Smith, Redd, Peyser, & Vogl, 1999). While events like the loss of a loved one, terrorist attacks, or natural disasters are distinct and retrospective, cancer stressors are multiple and exist both in the past and in the future, ranging from diagnosis and aggressiveness of treatments to impaired daily functioning and uncertainty of prognosis (Hou, Lam, & Fielding, 2009). Furthermore, contrary to the extreme levels of stress exposure in traumatic events, cancer stressors are subtle and ambiguous: adjuvant therapies cause intermittent sufferings to patients but at the same time give them hope for recovery (Weeks et al., 1998). One study has identified the four prototypical trajectories based on scores on the Center for Epidemiologic Studies-Depression scale in 84 breast cancer survivors in the six months posttreatment (Deshields, Tibbs, Fan, & Taylor, 2006). However, variations exist in the *recovery* trajectory, as some patients returned to normative functioning three months posttreatment (n = 8; “Recovery”) while others reported normative functioning not until the sixth month (n = 12; “Vacillate”). Representiveness of the findings is nonetheless limited by the small sample size and the short duration of follow-up. Helgeson, Snyder, and Seltman (2004) assessed 287 breast cancer patients (mean 4.5 years since diagnosis) in a 55-month period using the Mental Health Component Score (MCS) and identified two different *resilient* trajectories (MCS scores > 42; Ware, Kosinski, & Keller, 1994), one with stable levels of scores just above the cutoff and one with higher levels of scores, along with *chronic distress* (MCS scores ≤ 42) and *recovery* (MCS scores changed from ≤ 42 to > 42). Patients in the *chronic distress* trajectory were younger and more likely to have undergone mastectomy and chemotherapy compared with those in the *recovery* trajectory, and reported lower aggregated scores on personal resources (i.e., self-esteem, perceived personal control and uncertainty on the illness, benefit-finding) and social resources (i.e., social support, absence of negative

interpersonal interactions) than those in the *resilient* trajectories. This was the first study that examined the associations between personality and social correlates and differential trajectories in cancer patients. Costanzo, Ryff, and Singer (2009) have reported that heterogeneous cancer survivors (n = 207; median 10 years postdiagnosis), especially the younger ones, showed significant increase in depressive symptoms and greater negative affect but comparable social well-being during the 9-year study period compared with matched healthy controls; but the study did not identify differential patterns of change in psychological morbidity or well-being. More importantly, these studies did not capture arguably the most disruptive time immediately after diagnosis.

The conservation of resources (COR) theory suggests that resource change is the central mechanism driving adaptation (Hobfoll, 1998). Internal or personal resources include entities that are possessed by the self and can be mobilized on one's own. One typical personal resource is personality, such as cognitive evaluations on sense of self worth, general sense of mastery, or positive expectations of life events (Diener, Oishi, & Lucas, 2003). External resources include entities that are not possessed by the self but embedded within the physical environment or interactions with other people, such as money, employment, emotional or practical support, social contacts, and intimate relationships (House, Landis, & Umberson, 1988). Traumatic or disruptive life events have the power of depleting people's internal and external resources as well as psychological well-being; meanwhile people offset the ongoing situational demands by mobilizing these resources. Prevention of the depletion of resources and secondarily maintenance or gain of existing resources are thus the keys to maintaining healthy functioning in adaptation to stress (Hobfoll, 1998; Hobfoll et al., 2009). Change in optimism (Pinquart, Fröhlich, & Silbereisen, 2007; Schofield et al., 2004; Schou, Ekeberg, Sandvik, & Ruland, 2005), self-esteem (Vinokur, Threatt, Vinokur-Kaplan, & Satariano, 1990), mastery (Henselmans, Sanderman, Baas, Smink, & Ranchor, 2009; Revenson, Wollman, & Felton, 1983), and perceived social support (Alferi, Carver, Antoni,

Weiss, & Durán, 2001; Bolger, Foster, Vinokur, & Ng, 1996; Hipkins, Whitworth, Tarrier, & Jayson, 2004) has been commonly found among newly diagnosed cancer patients. Our previous study showed that loss in positive emotions as a coping resource mediates the association between physical symptom distress and psychological morbidity in the three months after a colorectal cancer (CRC) diagnosis (Hou, Law, & Fu, 2010). Loss in interpersonal resources (i.e., social support and relational quality) has also been found to mediate the association between physical or sexual abuse histories and psychiatric symptoms in heterogeneous female patients during the treatment process (Banou, Hobfoll, & Trochelman, 2009).

Using the growth mixture modeling approach, this study investigated heterogeneity of psychological adjustment in Chinese CRC patients in the first year following diagnosis and explored the impact of change in psychosocial resources on the trajectories. Remarkable increase in incidence and mortality of CRC among Chinese populations suggests a need to understand and optimize psychosocial adjustment for the patients (Parkin, Bray, Ferlay, & Pisani, 2005). As the People's Republic of China (PRC) modernizes, CRC has become the third most common cancer in urban Shanghai (Jin et al., 1999) and the fastest increasing cancer in Qidong city (Chen et al., 2006). In Hong Kong, the most developed city in the PRC, CRC accounts for over 16% of all cases, ranking second in incidence and mortality (Hong Kong Cancer Registry, 2009). Rapid increase in CRC incidence has also been observed in Taiwan (Yang, Parkin, Li, Chen, & Bray, 2004), while CRC is the most frequent cancer among Chinese Singaporeans (Seow et al., 2004). We have developed psychometric instruments assessing quality of life (QoL) (Law et al., 2008), social relational quality (Hou, Lam, Law, Fu, & Fielding, 2009), and cancer-related perceptions (Hou, 2010), and described the adaptation process (Hou, Lam, & Fielding, 2009; Hou et al., 2010) in Chinese CRC patients. Based on the COR theory (Hobfoll, 1998), this study extends our previous work to explore heterogeneous trajectories of adaptation to cancer and identify associated changes in

psychosocial resources. Internal and external resources represent a broad rubric of personal possessions, personalities, and social interactions and relationships related to healthy psychological functioning in stress adaptation. A thorough examination of all possible processes deemed adaptive for the patients is impractical. Therefore, we examined resources that are considered adaptive and common across most if not all cultures, including dispositional positive thinking, generic social relational quality, and adjustment-specific social support (Diener et al., 2003; House et al., 1988; Peterson, 2000; Reis, Collins, & Berscheid, 2000), together with physical functioning and background characteristics. We predicted the following:

Hypothesis 1: The four prototypical trajectories (i.e., classes) of psychological distress, namely *chronic distress*, *delayed distress*, *recovery*, and *resilient*, will emerge among patients in the year following a CRC diagnosis.

Hypothesis 2: Patients reporting stability/gain in psychosocial resources, including optimistic personalities, and social support and relational quality, will be more likely to follow the *resilient* and *recovery* trajectories than the *chronic distress* and *delayed distress* trajectories.

Hypothesis 3: Patients reporting loss in psychosocial resources will be more likely to follow the *chronic distress* and *delayed distress* trajectories than the *resilient* and *recovery* trajectories.

Method

Participants

This study is part of a larger prospective psychosocial research in Chinese people with CRC in Hong Kong. Inclusion criteria were (1) 21 years of age or older, (2) Cantonese fluency, (3) histological diagnosis of CRC within 12 weeks' time, and (4) no prior malignancies and associated therapies. Exclusion criteria included active Axis I psychiatric

disorders, linguistic/intellectual difficulties, brain metastasis, or serious medical condition(s) such as hypertension, diabetes, and cardiovascular disease. The 234 respondents ranged in age between 29 and 82 years (M = 64.44, SD =10.55, median = 67); 89 (38%) were female and 182 (78%) were married. Sixty-three (27%) reported receiving no formal education, 77 (33%) only primary education, and 94 (40%) at least secondary education. Fifty-seven (24%) reported an average monthly household income of less than HK$5,000, 68 (29%) reported $5,001-$10,000, 71 (30%) reported $10,001-$20,000, 24 (10%) reported $20,001-$30,000, and 14 (6%) reported an income of above $30,000.[1] Only 40 respondents (17%) reported a full-time/part-time employment and the remainder reported being housewives (n = 48, 21%), retired (n = 109, 47%), or unemployed (n = 37, 16%). One hundred and twenty-four (53%) respondents had colon cancer and 110 (47%) had rectal cancer; seven (3%) had Stage I, 47 (20%) Stage II, 133 (57%) Stage III, and 47 (20%) Stage IV disease based on the American Joint Committee on Cancer (AJCC) staging system. Most respondents (n = 203; 87%) had curative or palliative surgical resection, 67 (29%) of whom had a permanent colostomy.

Procedure

Upon obtaining Ethics Committees' approvals from the University of Hong Kong and the Hospital Authority, recruitment was conducted in the largest government-funded oncology unit in Queen Elizabeth Hospital (QEH) between July 2006 and March 2007. Clinical oncologists introduced the purpose of the study to 263 (86%) of the 305 suitable patients in the oncology unit; voluntary participation and data confidentiality were emphasized. The remainder (n = 42) either were too sick to participate or could not be identified at the time of recruitment. Interviewer (W. K. Hou) then confirmed the eligibility of potential respondents by referring to their hospital charts. After being fully apprised of the study, 234 (89%) patients gave their written consent and completed the baseline assessment

[1] US$1 = HK$7.80

(T1) in the unit via face-to-face interview. Among them, 215 completed the 3-month follow-up (T2) and 182 completed the 12-month follow-up (T3) via structured telephone interview. Nineteen respondents withdrew from T2 (death: n = 11; lost contact: n = 8) and 35 withdrew from T3 (death: n = 24; lost contact: n = 11). Because attrition due to death was not excessive, consisting of 58% and 68% of the total attrition at T2 and T3 respectively, and Chi-square tests did not reveal significant differences in any of the demographic or medical characteristics and physical and psychosocial variables between the respondents and different types of dropouts at respective time-point, missing data were replaced by multiple imputations using the program *Amelia II* (Honaker, King, & Blackwell, 2006) implemented on R version 2.9.1. Each missing value became a set of plausible values that represent the uncertainty about the right value to impute (Rubin, 2004). Trends of time were included as an additional condition and allowed to vary across respondents to ensure maximal heterogeneity of the imputed data.

Measures

We used a standardized pro-forma to obtain demographic information and a Chart Review Data Sheet to record medical information from hospital charts. Psychological morbidity was assessed at all three time-points whereas physical functioning and psychosocial resources at T1 and T3 (Table 1).

Insert Table 1 about here.

Psychological morbidity. The 14-item Chinese Hospital Anxiety and Depression Scale (HADS; Leung, Ho, Kan, Hung, & Chen, 1993) assessed psychological morbidity, sample items: “I feel restless as I have to be on the move.”; “I still enjoy the things I used to enjoy.” (reverse coded). Respondents answered each item by indicating on a 4-point scale (e.g., 0 = *not at all*, 3 = *very much indeed*). A total score was calculated by summing across the 14

items (range = 0-42). A cutoff score of 15 was used to index clinically significant distress (Trask, 2004). Cronbach's alphas for the HADS were .87, .92, and .96 respectively on the current three administrations.

Physical functioning. A 9-item checklist assessed general and CRC-specific symptoms: stomachache, gas/bloating, belching, proctalgia, sleeping problems, fatigue, pain, nausea, and loss of appetite (Given, Given, & Stommel, 1994; Hou, Lam, & Fielding, 2009). Respondents rated the presence and severity of each symptom in the past week on a 4-point scale from 0 (*not at all*) to 3 (*very much*). The summed scores were reverse coded, with higher scores indicating better physical functioning (i.e. lower levels of symptom distress). Alphas for the two administrations were .71 and .78 respectively.

Optimistic personalities. The 6-item Chinese Revised Life Orientation Test (C-LOT-R; Lai, Cheung, Lee, & Yu, 1998) was used to assess positive outcome expectancies on a 4-point scale (1 = *strongly disagree*, 4 = *strongly agree*). Three negatively worded (pessimism) items were reverse scored and summed with three positively worded (optimism) items, sample item: "In uncertain times, I usually expect the best." (Scheier, Carver, & Bridges, 1994). Alphas on the current two administrations were .76 and .84 respectively. The Chinese version of the 8-item Hope Scale (HS) assessed bi-facet dispositional hope, *Will* (a motivated state to reach desired goals) and *Ways* (a sense that one will be able to successfully generate a plan to attain them), sample item: "I can think of many ways to get out of jam." (Snyder et al., 1991). Respondents rated each item on a 4-point scale as in the C-LOT-R. Alphas for the HS were .84 and .74 respectively on the current administrations. The C-LOT-R and HS scores at T3 were highly correlated (r = .74). We factor analyzed the item scores of C-LOT-R and HS at T3 to see if the two sets of scores load on separate factors (loadings > .40). A 2-factor model emerged, with the HS items loading on the first factor (55.15% of the observed variance) and the C-LOT-R items on the second factor (7.63% of the observed variance), suggesting that optimism and hope were closely related but distinct constructs in the present

sample.

Social support. Three items assessed sufficiency of received emotional and instrumental support (Seeman & Berkman, 1988). Respondents indicated on a 4-point scale for each item (1 = *a lot*, 4 = *received sufficient support*), sample items: "Could you have used more emotional support than you received?"; "Could you have used more help with daily tasks than you received?" Overall sufficiency was indexed by summing across the three items. Alphas for the two administrations were .67 and .64 respectively.

Relational quality. The Social Relational Quality Scale (SRQS; Hou, Lam, Law, et al., 2009) assessed quality of the relationships with family members and friends in the general sense with a 4-point scale (1 = *strongly disagree*, 4 = *strongly agree*), sample items: "When I am upset, my family will be upset too." (*Family Intimacy*); "I am committed to maintaining my relationship with my family." (*Family Commitment*); "I can rely on my friends in different situations." (*Friendship*). The 17 items were summed to form an overall score. Alphas were .88 and .94 respectively on the two administrations.

Analytic Plan

T1 scores on physical functioning and psychosocial resources were subtracted from the T3 scores to obtain a measure reflecting change. The difference scores were used to create three change groups, with *loss* and *gain* being indicated by $\geq .50$ *SD* of change on the scores and *stability* being indicated by $< .50$ *SD* of change on the scores. This method of grouping can distinguish unique upward and downward changes in resources (Hobfoll, Johnson, Ennis, & Jackson, 2003; Holahan, Moos, Holahan, & Cronkite, 1999, 2000; Hou et al., 2010). Means and *SD*s of the HADS scores for the change groups are summarized in Table 2.

Insert Table 2 about here.

Growth mixture modeling is a longitudinal analysis for modeling heterogeneous

growth trajectories. This method identifies a latent class variable that captures the differences in growth parameter means (i.e., intercept and slope) between trajectories (B. O. Muthén, 2001). We used M*plus* version 5.2 (L. K. Muthén & Muthén, 2008) to construct the growth mixture models (GMMs) with linear and quadratic effects of time. A cubic effect of time would be added to improve model fit if we found (1) an unsatisfactory representation of the changes in psychological distress (HADS scores) for any class(es) or (2) marked departures of the estimated parameters from the observed data. A simple GMM with specified patterns (i.e., *chronic distress*, *delayed distress*, *recovery*, and *resilient*) was estimated based on T1, T2, and T3 HADS scores. To evaluate whether the 4-class solution is optimal for the present data (*Hypothesis 1*), the *p* values for the Lo-Mendell-Rubin's adjusted likelihood ratio test (LRT) and the bootstrap LRT (BLRT) were checked. A significant *p* value indicates that a *k*-class model (i.e. 4-class model) demonstrates a significant increase in the model fit than a *k*-1-class model (i.e. 3-class model) (Nylund, Asparouhov, & Muthén, 2007). Three methods were used to assess model fit. First, the Akaike information criterion (AIC), Bayesian information criterion (BIC), and sample size-adjusted BIC (ABIC) were examined: the smaller the AIC, BIC, and ABIC values, the better the model fit. Second, the entropy indices (EI) and the estimated posterior probabilities (EPP) of class membership (range = 0-1) were checked to ensure quality and reliability of the classification. An index close to one indicates good classification. Third, the mean intercept and slope for each class were checked to determine if a class characterized one of the growth patterns.

We then produced a conditional GMM with change groups of physical functioning and psychosocial resources (i.e., loss vs. stability/gain) as covariates of the class membership (*Hypothesis 2* and *Hypothesis 3*). Among all demographic and medical variables, correlations revealed that age, education level, and income level were significantly correlated with HADS scores (r = -.13 to -.22; $p < .05$), while independent-samples *t* tests revealed that women reported worse physical functioning at T1 [$t(232) = 3.79$, $p = .001$] and married individuals

reported better social relational quality at T3 [$t(180) = 2.52$, $p = .013$]. These variables were therefore included as covariates in the GMM as well. In the multinomial logit models in the GMM, the *chronic distress* class was initially set to be the reference category and assigned a zero logistic regression coefficient because long-term psychological morbidity is the most frequently studied outcome in the cancer literature (e.g. Stommel, Kurtz, Kurtz, Given, & Given, 2004; van't Spijker, Trijsburg, & Duivenvoorden, 1997). Logits were calculated for the other categories relative to the *chronic distress*, becoming a linear function of the covariates. The *resilient* class was then set to be the reference category. Table 3 summarizes the correlations among the study variables.

Insert Table 3 about here.

Results

Simple Model

The LRT and BLRT for the 4-class solution were significant ($p = .0027$; $p < .00001$), suggesting an increase in model fit for the solution (compared with a 3-class solution); the LRT and BLRT for a 5-class solution were not significant, suggesting that using the 5-class solution does not improve the model fit. The 4-class solution was shown to be a better fit. The four prototypical trajectories emerged (Figure 1), with a log likelihood H0 of -2425.44, AIC of 4884.87, BIC of 4943.61, ABIC of 4889.73, EI of .89, and EPPs over .80 (range = .83 - .97) (Table 4). Referring to the mean intercept and slope values, Class 1 (*delayed distress*; 13%) demonstrated significant increase in HADS scores from lower to higher levels (i.e. ≥ 15), Class 2 (*resilient*; 67%) demonstrated stably low distress (i.e. HADS scores < 15), Class 3 (*chronic distress*; 7%) demonstrated maintenance of high distress, and Class 4 (*recovery*; 13%) demonstrated significant decrease in distress from higher to lower levels.

Insert Figure 1 and 2 about here.

Predicting Class Membership

The four prototypical trajectories were replicated in the model with demographics and change groups as covariates of class membership (Figure 2), showing improved model fit statistics and parameter estimates: log likelihood H0 = -2364.78; AIC = 4823.56; BIC = 4985.96; ABIC = 4836.99, EI = .90; EPP = .92-.96. Class 1 (10%) resembled *delayed distress*, Class 2 (16%) *recovery*, Class 3 (65%) *resilient*, and Class 4 (9%) *chronic distress* (Table 4).[2] Medical characteristics of the respondents in the four classes are summarized in Table 5.

Insert Table 4 and 5 about here.

Profiling Differential Trajectories

Compared with the *chronic distress* group, the *delayed distress* group was more likely to report stability/gain in physical functioning and social relational quality but less likely to be married and report stability/gain in social support; the *recovery* group was more likely to demonstrate stability/gain in physical functioning, optimism, and hope; the *resilient* group was more like to be older and report higher income, but less likely to be married and report stability/gain in social support (Table 6). Additional GMM analyses showed that *resilient* patients were more likely to demonstrate stability/gain in optimism [Estimate = -1.63; odds ratio (OR) = .20; 95% confidence interval (CI) = -3.38, .13; p = .017] and hope (Estimate = -1.09; OR = .34; 95% CI = -2.35, .18; p = .027) than the *delayed distress* group; they were more likely to be older (Estimate = -.08; OR = .92; 95% CI = -.15, .00; p = .010) but less

[2] We have run a GMM with the initial levels of resources as covariates. The GMM with T1 resources as covariates did not identify the four trajectories revealed in previous studies (e.g. Bonanno et al., 2002, 2008) and our model using change groups of differential resources as covariates.

likely to demonstrate stability/gain in optimism (Estimate = 1.10; OR = 3.02; 95% CI = .01, 2.20; p = .001) than the *recovery* group.

Insert Table 6 about here.

Discussion

This study identifies and profiles differential trajectories of psychological outcomes in one of the largest Chinese cancer samples in the current literature. The majority of the CRC patients (65-67%) demonstrated the *resilient* trajectory, followed by the *recovery* (13-16%) and the *delayed distress* (10-13%) trajectories; the minority (7-9%) was in the *chronic distress* trajectory. The results are consistent with those obtained in people adapting to bereavement (Bonanno et al., 2002), terrorist threat (Bonanno et al., 2006), life in a war zone (Hobfoll et al., 2009), and after aggressive inpatient treatment for SARS (Bonanno et al., 2008), except for a higher prevalence of resilience. However, among a sample of breast cancer survivors, Helgeson et al. (2004) identified two *resilient* trajectories and no *delayed distress* trajectory; younger age and disease-related variables namely mastectomy and chemotherapy receipt distinguished *chronic distress* from *recovery*, whereas aggregated baseline scores on personality resources and social resources distinguished *chronic distress* from *resilient*. We have run a GMM with the baseline scores of the psychosocial variables as covariates but the four trajectories did not emerge in the model. Discrepancy in the results of the two studies might be due to differences in sample size (n = 283 vs. n = 234), sample characteristics (e.g. age, time since diagnosis, female breast vs. male and female CRC), nature of psychosocial resources (aggregated vs. individual), and/or measures of the resources in the GMM (baseline scores vs. change groups). Nevertheless, these results, when taken together, suggest that the four adaptation trajectories are applicable for explaining psychological adjustment among cancer populations, and the patterns of change than the

baseline levels of personality resources and social resources could be more suitable for characterizing these trajectories.

Consistent with previous evidence (Arndt, Merx, Stegmaier, Ziegler, & Brenner, 2004; Carlson et al., 2004), younger age and lower income significantly predicted the *chronic distress* trajectory among Chinese CRC patients. Surprisingly, we found that *chronic distress* patients were more likely to be married compared with the *delayed distress* and *resilient* patients, contrary to the current evidence on the protective effect of marital relationship against psychological distress among CRC patients (Goldzweig et al., 2009). The *chronic distress* patients also reported significant loss in relational quality relative to the *delayed distress* patients. Apart from being the major supplier of support for the patients (Helgeson & Cohen, 1996), spouse is also the most likely partner for interpersonal conflicts with the patients, particularly when relational quality is low (Manne, Alfieri, Taylor, & Dougherty, 1999). Tensions in marital relationship could contribute to sustained psychological distress in Chinese CRC patients.

We further provide novel evidence on the association between the dynamics of psychosocial resources and heterogeneity in adaptation to cancer. Previous studies reported that resource loss significantly predicts psychological morbidity in adjustment to cancer diagnosis and treatment (Banou et al., 2009; Hou et al., 2010); change in psychosocial resources has also been found to be common in the year following diagnosis (Bolger et al., 1996; Henselmans et al., 2009; Pinquart et al., 2007; Revenson et al., 1983; Schofield et al., 2004; Schou et al., 2005; Vinokur et al., 1990). However, very little is known about the association between change in resources and adaptation trajectories in cancer patients. In line with Hobfoll's COR theory (Hobfoll, 1998) and our previous qualitative findings (Hou, Lam, & Fielding, 2009), this study found that the four trajectories of psychological distress were associated with the change in differential resources among newly diagnosed CRC patients. An interesting point to note is that the *delayed distress* group demonstrated improved

physical functioning in conjunction with increased psychological distress, possibly showing the benefit and cost of using repressive coping (Coifman, Bonanno, Ray, & Gross, 2007).

Specifically, our findings clarify the dynamics of dispositional optimism (Scheier et al., 1994) and bi-facet Hope, *Will* and *Ways* (Snyder et al., 1991), in adaptation to cancer diagnosis and treatment. Both decline (Pinquart et al., 2007; Schofield et al., 2004) and stability (Schou et al., 2005; Stiegelis et al., 2003) have been reported for optimism and hope of cancer patients in the year after diagnosis. Supplementing current evidence, we identified in a single sample of patients that optimism and hope are likely to increase as well as decrease and maintain, and maintenance or gain in optimistic personalities is associated with recovery from emotional distress and even preservation of resilience. The change in optimism can be interpreted in light of adaptive coping strategies. The benefit of optimistic personalities has been found to be mediated by coping strategies including positive reinterpretations, fatalistic thoughts, and active problem-solving (Epping-Jordan et al., 1999; Stanton, Danoff-Burg, & Huggins, 2002). These coping strategies might avoid erosion of dispositional positive thinking, contributing in turn to better psychological functioning.

Our findings also extend the current understanding on the impact of social support in the cancer process. Caucasian and Hispanic women perceiving sustainable availability of social support have been found to report lower levels of psychological distress a year after diagnosis (Alferi et al., 2001; Hipkins et al., 2004). However, there is also evidence suggesting that emotional distress erodes the support from close social partners among breast cancer patients (Bolger et al., 1996). In this study, Chinese CRC patients in the *chronic distress* trajectory were more likely to report stability/gain in perceived sufficiency of received social support than those in the *delayed distress* and *resilient* trajectories. It is likely that the more distressed the patients were, the more support they received from their close social partners throughout the process (Seidman, Shrout, & Bolger, 2006); or, some *chronic distress* patients consistently reported lower levels of social support, contributing to enduring

psychological distress. It is also likely that received support might have a negative buffering effect. Feelings of indebtedness or inequality are not uncommon following support receipt (Gleason, Iida, Bolger, & Shrout, 2003). Perceived support has been found to be positively associated with psychological distress among Chinese, contrary to a positive buffering effect among Caucasians (Liang & Bogat, 1994). Future studies could explore in larger samples of cancer patients the longitudinal reciprocal causality between social support and psychological distress and the possible cross-cultural differences in the utility of social support.

There might exist an interaction between social support and relational quality. Positive association has been found between perceived partner support and marital satisfaction in a sample of Caucasian heterogeneous cancer survivors, and the association was strong among those reporting higher physical impairment (Hagedoorn et al., 2000). We found in this newly diagnosed sample that *delayed distress* patients relative to *chronic distress* patients were more likely to show stability/gain in relational quality but loss in social support despite stable or improved physical functioning. The opposite changes in support and relational quality in the *delayed distress* trajectory are consistent with interpersonal interactions within a more collectivistic sociocultural context: Chinese people prioritize maintenance of relational harmony and interpersonal well-being over seeking social support in coping with stress (Mesquita & Karasawa, 2002; Schaubroeck, Lam, & Xie, 2000). In particular, Chinese cancer patients have reported worry more about increasing distress and burdens to family members than about recovery from the illness (Hou, Lam, & Fielding, 2009; Yan & Sellick, 2004). Therefore, the lesser burdens the patients give to close social partners, the better the relationship they perceive with them. However, despite maintenance of relational quality and interpersonal well-being these people experienced increasing psychological distress. An optimal social environment for facilitating resilience might include relational quality as well as invisible support, referring to the support that is useful but neither noticed nor interpreted by the recipients as support, given the possible negative buffering effect of perceived social

support (Bolger & Amarel, 2007; Bolger, Zuckerman, & Kessler, 2000). Future studies could investigate the interactive impact of relational quality with both visible and invisible support in adaptation to cancer.

Limitations and Conclusions

A number of limitations warrant discussion. First, the respondents were a convenience Chinese sample from one tertiary clinic in Hong Kong. There is ample evidence that Asian people differ from Western people in preserving psychological integrity when facing massive threats, such as employing a fatalistic attribution style or exercising indirect control through relying on more powerful others in problem-solving (Bandura, 1997; Yamaguchi, 2001). The sociocultural characteristics of the present sample limit the generalizability of the findings to other cancer populations. Second, the measures of physical symptoms and social support were not a formal instrument and were selected for parsimony, and all of the measures come from self-reports, so some caution is needed in interpreting the findings. Moreover, we did not assess dispositional self-efficacy/mastery, which tends to be associated with prognosis and increase during the first year of diagnosis (Henselmans et al., 2009; Revenson et al., 1983). It is yet to be explored whether increase in self-efficacy/mastery might differentiate *resilient* and *recovery* from *chronic distress* and *delayed distress* trajectories. We were not able to obtain pre-diagnosis data on the anxiety/depression levels of respondents. Therefore, *chronic distress* may be confused with preexisting chronic anxiety/depression and *resilient* may be confused with improved psychological functioning immediately following diagnosis. In addition, although the four trajectories identified in this study are widely used and replicated in diverse samples, ambiguity exists in characterizing the four trajectories. For example, it is likely that the *resilient* group is exhibiting adaptive emotion regulation over time; it is also possible that this group comprises patients who cope by using repression/suppression, or avoidance. Also, differential trajectories would have been generated for cancer-specific distress, as some patients who are free of generalized

psychological distress might demonstrate significant cancer-specific distress like worry or anxiety (e.g. Costanzo et al., 2007). Lastly, this study does not test the possibility of distinct interactions or combined effects of changes in the examined resources.

Notwithstanding these limitations, this prospective study contributes to advancing psychosocial research and service for cancer patients. Instead of focusing primarily on the initial preexisting psychosocial resources that are seemingly unalterable in the coping processes, we document the association between change in psychosocial resources and heterogeneity in the timing and persistence of psychological morbidity, showing feasible directions for developing supportive care for different patients in the diagnosis and treatment process. To prevent *delayed distress*, intervention programs could educate patients on skills for positive interpersonal interactions and educate close social partners on skills for providing "invisible support", such as avoiding communication of inefficacy to the patients (Bolger & Amarel, 2007). On the other hand, recognizing loss in optimism as a significant hindrance for recovering from emotional distress, clinical services for initially distressed patients should be incorporated with psychoeducational programs that cultivate positive outcome expectancies (i.e., optimism) and/or goal-directed positive thinking (i.e., Hope) such as teaching strategies to identify and attain desirable treatment or rehabilitation goals (Hou, 2010; MacLeod, Coates, & Hetherton, 2008; Sheldon, Kasser, Smith, & Share, 2002). It is important for the goals to be realistic and attainable, as patients who show unrealistic expectations while receiving curative treatments have been found to exhibit poorer adjustment (Stanton et al., 1998), while terminal cancer patients who are overly optimistic might tend to overestimate their survival probabilities and opt for aggressive treatments, which do not prolong their life but deteriorate their QoL (Weeks et al., 1998).

References

Alferi, S. M., Carver, C. S., Antoni, M. H., Weiss, S., & Durán, R. E. (2001). An exploratory

study of social support, distress, and life disruption among low-income hispanic women under treatment for early stage breast cancer. *Health Psychology*, *20*, 41-46.

Arndt, V., Merx, H., Stegmaier, C., Ziegler, H., & Brenner, H. (2004). Quality of life in patients with colorectal cancer 1 year after diagnosis compared with the general population: A population-based study. *Journal of Clinical Oncology*, *22*, 4829-4836.

Aspinwall, L. G., & MacNamara, A. (2005). Taking positive changes seriously: Toward a positive psychology of cancer survivorship and resilience. *Cancer*, *104*, 2549-2556.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.

Banou, E., Hobfoll, S. E., & Trochelman, R. D. (2009). Loss of resources as mediators between interpersonal trauma and traumatic and depressive symptoms among women with cancer. *Journal of Health Psychology*, *14*, 200-214.

Bolger, N., & Amarel, D. (2007). Effects of social support visibility on adjustment to stress: Experimental evidence. *Journal of Personality and Social Psychology*, *92*, 458-475.

Bolger, N., Foster, M., Vinokur, A. D., & Ng, R. (1996). Close relationships and adjustment to a life crisis: The case of breast cancer. *Journal of Personality and Social Psychology*, *70*, 283-294.

Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of Personality and Social Psychology*, *79*, 953-961.

Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, *59*, 20-28.

Bonanno, G. A., Galea, S., Bucciarelli, A., & Vlahov, D. (2006). Psychological resilience after disaster: New York City in the aftermath of the September 11th terrorist attack. *Psychological Science*, *17*, 181-186.

Bonanno, G. A., Galea, S., Bucciarelli, A., & Vlahov, D. (2007). What predicts psychological resilience after disaster? The role of demographics, resources, and life stress. *Journal*

of Consulting and Clinical Psychology, 75, 671-682.

Bonanno, G. A., Ho, S. M. Y., Chan, J. C. K., Kwong, R. S. Y., Cheung, C. K. Y., Wong, C. P. Y., & Wong, V. C. (2008). Psychological resilience and dysfunction among hospitalized survivors of the SARS epidemic in Hong Kong: A latent class approach. *Health Psychology*, *27*, 659-667.

Bonanno, G. A., Wortman, C. B., Lehman, D. R., Tweed, R. G., Haring, M., Sonnega, J., & Nesse, R. M. (2002). Resilience to loss and chronic grief: A prospective study from preloss to 18-months postloss. *Journal of Personality and Social Psychology*, *83*, 1150-1164.

Bonanno, G. A., Wortman, C. B., & Nesse, R. M. (2004). Prospective Patterns of Resilience and Maladjustment During Widowhood. *Psychology and Aging*, *19*, 260-271.

Carlson, L. E., Angen, M., Cullum, J., Goodey, E., Koopmans, J., Lamont, L., … Bultz, B. D. (2004). High levels of untreated distress and fatigue in cancer patients. *British Journal of Cancer*, *90*, 2297-2304.

Chen, J. G., Zhu, J., Parkin, D. M., Zhang, Y. H., Lu, J. H., Zhu, Y. R., & Chen, T. Y. (2006). Trends in the incidence of cancer in Qidong, China, 1978-2002. *International Journal of Cancer*, *119*, 1447-1454.

Coifman, K. G., Bonanno, G. A., Ray, R. D., & Gross, J. J. (2007). Does repressive coping promote resilience? Affective-autonomic response discrepancy during bereavement. *Journal of Personality and Social Psychology*, *92*, 745-758.

Costanzo, E. S., Lutgendorf, S. K., Mattes, M. L., Trehan, S., Robinson, C. B., Tewfik, F., & Roman, S. L. (2007). Adjusting to life after treatment: Distress and quality of life following treatment for breast cancer. *British Journal of Cancer*, *97*, 1625-1631.

Costanzo, E. S., Ryff, C. D., & Singer, B. H. (2009). Psychosocial adjustment among cancer survivors: Findings from a national survey of health and well-being. *Health Psychology*, *28*, 147-156.

Coughlin, S. S. (2008). Surviving cancer or other serious illness: A review of individual and community resources. *CA: A Cancer Journal for Clinicians, 58*, 60-64.

Deshields, T., Tibbs, T., Fan, M. Y., & Taylor, M. (2006). Differences in patterns of depression after treatment for breast cancer. *Psycho-Oncology, 15*, 398-406.

Diener, E., Oishi, S., & Lucas, R. E. (2003). Personality, culture, and subjective well-being: Emotional and cognitive evaluations of life. *Annual Review of Psychology, 54*, 403-425.

Epping-Jordan, J. E., Compas, B. E., Osowiecki, D. M., Oppedisano, G., Gerhardt, C., Primo, K., & Krag, D. N. (1999). Psychological adjustment in breast cancer: Processes of emotional distress. *Health Psychology, 18*, 315-326.

Given, C. W., Given, B. A., & Stommel, M. (1994). The impact of age, treatment, and symptoms on the physical and mental health of cancer patients. A longitudinal perspective. *Cancer, 74*, 2128-2138.

Gleason, M. E. J., Iida, M., Bolger, N., & Shrout, P. E. (2003). Daily supportive equity in close relationships. *Personality and Social Psychology Bulletin, 29*, 1036-1045.

Goldzweig, G., Andritsch, E., Hubert, A., Walach, N., Perry, S., Brenner, B., & Baider, L. (2009). How relevant is marital status and gender variables in coping with colorectal cancer? A sample of middle-aged and older cancer survivors. *Psycho-Oncology, 18*, 866-874.

Hagedoorn, M. t., Kuijer, R. G., Buunk, B. P., DeJong, G. M., Wobbes, T., & Sanderman, R. (2000). Marital satisfaction in patients with cancer: Does support from intimate partners benefit those who need it most? *Health Psychology, 19*, 274-282.

Helgeson, V. S., & Cohen, S. (1996). Social support and adjustment to cancer: Reconciling descriptive, correlational, and intervention research. *Health Psychology, 15*, 135-148.

Helgeson, V. S., Snyder, P., & Seltman, H. (2004). Psychological and physical adjustment to breast cancer over 4 years: Identifying distinct trajectories of change. *Health*

Psychology, 23, 3-15.

Henselmans, I., Sanderman, R., Baas, P. C., Smink, A., & Ranchor, A. V. (2009). Personal control after a breast cancer diagnosis: Stability and adaptive value. *Psycho-Oncology, 18*, 104-108.

Hipkins, J., Whitworth, M., Tarrier, N., & Jayson, G. (2004). Social support, anxiety and depression after chemotherapy for ovarian cancer: a prospective study. *Journal of Health Psychology, 9*, 569-581.

Hobfoll, S. E. (1998). *Stress, culture, and community: The psychology and philosophy of stress*. New York: Plenum Press.

Hobfoll, S. E., Johnson, R. J., Ennis, N., & Jackson, A. P. (2003). Resource loss, resource gain, and emotional outcomes among inner city women. *Journal of Personality and Social Psychology, 84*, 632-643.

Hobfoll, S. E., Palmieri, P. A., Johnson, R. J., Canetti-Nisim, D., Hall, B. J., & Galea, S. (2009). Trajectories of resilience, resistance, and distress during ongoing terrorism: The case of Jews and Arabs in Israel. *Journal of Consulting and Clinical Psychology, 77*, 138-148.

Holahan, C. J., Moos, R. H., Holahan, C. K., & Cronkite, R. C. (1999). Resource loss, resource gain, and depressive symptoms: A 10-year model. *Journal of Personality and Social Psychology, 77*, 620-629.

Holahan, C. J., Moos, R. H., Holahan, C. K., & Cronkite, R. C. (2000). Long-term posttreatment functioning among patients with unipolar depression: An integrative model. *Journal of Consulting and Clinical Psychology, 68*, 226-232.

Honaker, J., King, G., & Blackwell, M. (2006). Amelia II: A Program for Missing Data. Cambridge, MA: Harvard University. http://gking.harvard.edu/amelia.

Hong Kong Cancer Registry (2009). *Cancer Statistics 2007*. Hong Kong: Hong Kong Hospital Authority.

Hou, W. K. (2010). Intrapersonal and interpersonal dimensions of cancer perception: A confirmatory factor analysis of the Cancer Experience and Efficacy Scale (CEES). *Supportive Care in Cancer, 18,* 561-571.

Hou, W. K., Lam, W. W. T., & Fielding, R. (2009). Adaptation process and psychosocial resources of Chinese colorectal cancer patients undergoing adjuvant treatment: A qualitative analysis. *Psycho-Oncology, 18,* 936-944.

Hou, W. K., Lam, W. W. T., Law, C. C., Fu, Y. T., & Fielding, R. (2009). Measuring social relational quality in colorectal cancer: The Social Relational Quality Scale (SRQS). *Psycho-Oncology, 18,* 1097-1105.

Hou, W. K., Law, C. C., & Fu, Y. T. (2010). Does change in positive affect mediate and/or moderate the impact of symptom distress on psychological adjustment after diagnosis? A prospective analysis. *Psychology and Health, 25*, 417-431.

House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science, 241,* 540-545.

Jin, F., Devesa, S. S., Chow, W. H., Zheng, W., Ji, B. T., Fraumeni, J. F., Jr., & Gao, Y. T. (1999). Cancer incidence trends in urban shanghai, 1972-1994: An update. *International Journal of Cancer, 83,* 435-440.

Kangas, M., Henry, J. L., & Bryant, R. A. (2002). Posttraumatic stress disorder following cancer. A conceptual and empirical review. *Clinical Psychology Review, 22,* 499-524.

Lai, J. C. L., Cheung, H., Lee, W.-m., & Yu, H. (1998). The utility of the revised Life Orientation Test to measure optimism among Hong Kong Chinese. *International Journal of Psychology, 33,* 45-56.

Law, C. C., Tak Lam, W. W., Fu, Y. T., Wong, K. H., Sprangers, M. A., & Fielding, R. (2008). Validation of the Chinese version of the EORTC colorectal cancer-specific quality-of-life questionnaire module (QLQ-CR38). *Journal of Pain and Symptom Management, 35,* 203-213.

Leung, C. M., Ho, S., Kan, C. S., Hung, C. H., & Chen, C. N. (1993). Evaluation of the Chinese version of the Hospital Anxiety and Depression Scale. A cross-cultural perspective. *International Journal of Psychosomatics, 40*, 29-34.

Liang, B., & Bogat, G. A. (1994). Culture, control, and coping: New perspectives on social support. *American Journal of Community Psychology, 22*, 123-147.

MacLeod, A. K., Coates, E., & Hetherton, J. (2008). Increasing well-being through teaching goal-setting and planning skills: Results of a brief intervention. *Journal of Happiness Studies, 9*, 185-196.

Manne, S. L., Alfieri, T., Taylor, K. L., & Dougherty, J. (1999). Spousal negative responses to cancer patients: The role of social restriction, spouse mood, and relationship satisfaction. *Journal of Consulting and Clinical Psychology, 67*, 352-361.

Mesquita, B., & Karasawa, M. (2002). Different emotional lives. *Cognition and Emotion, 16*, 127-141.

Muthén, B. O. (2001). Second-generation structural equation modeling with a combination of categorical and continuous latent variables: New opportunities for latent class-latent growth modeling. In L. M. Collins & A. Sayer (Eds.), *New methods for the analysis of change* (pp. 289-322). Washington, DC: American Psychological Association.

Muthén, L. K., & Muthén, B. O. (2008). *Mplus User's Guide* (5th ed.). Los Angeles, CA: Muthén & Muthén.

Norris, F. H., Tracy, M., & Galea, S. (2009). Looking for resilience: Understanding the longitudinal trajectories of responses to stress. *Social Science and Medicine, 68*, 2190-2198.

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling, 14*, 535-569.

Parkin, D. M., Bray, F., Ferlay, J., & Pisani, P. (2005). Global cancer statistics, 2002. *CA: A*

Cancer Journal for Clinicians, 55, 74-108.

Peterson, C. (2000). The future of optimism. *American Psychologist, 55,* 44-55.

Pinquart, M., Fröhlich, C., & Silbereisen, R. K. (2007). Change in psychological resources of younger and older cancer patients during chemotherapy. *Psycho-Oncology, 16,* 626-633.

Reis, H. T., Collins, W. A., & Berscheid, E. (2000). The relationship context of human behavior and development. *Psychological Bulletin, 126,* 844-872.

Revenson, T. A., Wollman, C. A., & Felton, B. J. (1983). Social supports as stress buffers for adult cancer patients. *Psychosomatic Medicine, 45,* 321-331.

Rubin, D. B. (2004). *Multiple imputation for nonresponse in surveys*. Hoboken, N.J.: Wiley-Interscience.

Schaubroeck, J., Lam, S. S. K., & Xie, J. L. (2000). Collective efficacy versus self-efficacy in coping responses to stressors and control: A cross-cultural study. *Journal of Applied Psychology, 85,* 512-525.

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology, 67,* 1063-1078.

Schofield, P., Ball, D., Smith, J. G., Borland, R., O'Brien, P., Davis, S., … Joseph, D. (2004). Optimism and survival in lung carcinoma patients. *Cancer, 100,* 1276-1282.

Schou, I., Ekeberg, O., Sandvik, L., & Ruland, C. M. (2005). Stability in optimism-pessimism in relation to bad news: A study of women with breast cancer. *Journal of Personality Assessment, 84,* 148-154.

Seeman, T. E., & Berkman, L. F. (1988). Structural characteristics of social networks and their relationship with social support in the elderly: Who provides support. *Social Science and Medicine, 26,* 737-749.

Seidman, G., Shrout, P. E., & Bolger, N. (2006). Why is enacted social support associated

with increased distress? Using simulation to test two possible sources of spuriousness. *Personality and Social Psychology Bulletin, 32*, 52-65.

Seow, A., Koh, W. P., Chia, K. S., Shi, L. M., Lee, H. P., & Shanmugaratnam, K. (2004). *Trends in cancer incidence in Singapore 1968-2002. Singapore Cancer Registry Report number 6*. Singapore: Singapore Cancer Registry.

Sheldon, K. M., Kasser, T., Smith, K., & Share, T. (2002). Personal goals and psychological growth: Testing an intervention to enhance goal attainment and personality integration. *Journal of Personality, 70*, 5-31.

Smith, M. Y., Redd, W. H., Peyser, C., & Vogl, D. (1999). Post-traumatic stress disorder in cancer: A review. *Psycho-Oncology, 8*, 521-537.

Snyder, C. R., Harris, C., Anderson, J. R., Holleran, S. A., Irving, L. M., Sigmon, S. T., … Harney, P. (1991). The will and the ways: Development and validation of an individual-differences measure of hope. *Journal of Personality and Social Psychology, 60*, 570-585.

Stanton, A. L., Danoff-Burg, S., & Huggins, M. E. (2002). The first year after breast cancer diagnosis: Hope and coping strategies as predictors of adjustment. *Psycho-Oncology, 11*, 93-102.

Stanton, A. L., Estes, M. A., Estes, N. C., Cameron, C. L., Danoff-Burg, S., & Irving, L. M. (1998). Treatment decision making and adjustment to breast cancer: A longitudinal study. *Journal of Consulting and Clinical Psychology, 66*, 313-322.

Staudinger, U. M., Marsiske, M., & Baltes, P. B. (1995). Resilience and reserve capacity in later adulthood: Potentials and limits of development across the life span. In D. Cicchetti & D. Cohen (Eds.), *Developmental Psychopathology Volume 2: Risk, Disorder, and Adaptation* (pp. 801-847). New York: Wiley.

Stiegelis, H. E., Hagedoorn, M. t., Sander-man, R., van der Zee, K. I., Buunk, B. P., & van den Bergh, A. C. M. (2003). Cognitive adaptation: A comparison of cancer patients

and healthy references. *British Journal of Health Psychology, 8,* 303-318.

Stommel, M., Kurtz, M. E., Kurtz, J. C., Given, C. W., & Given, B. A. (2004). A longitudinal analysis of the course of depressive symptomatology in geriatric patients with cancer of the breast, colon, lung, or prostate. *Health Psychology, 23,* 564-573.

Trask, P. C. (2004). Assessment of depression in cancer patients. *Journal of the National Cancer Institute. Monographs, 32,* 80-92.

van't Spijker, A., Trijsburg, R. W., & Duivenvoorden, H. J. (1997). Psychological sequelae of cancer diagnosis: A meta-analytical review of 58 studies after 1980. *Psychosomatic Medicine, 59,* 280-293.

Vinokur, A. D., Threatt, B. A., Vinokur-Kaplan, D., & Satariano, W. A. (1990). The process of recovery from breast cancer for younger and older patients. Changes during the first year. *Cancer, 65,* 1242-1254.

Ware, J. E., Kosinski, M., & Keller, S. D. (1994). *SF-36 Physical and Mental Health Summary Scales: A user's manual*. Boston: Health Institute.

Weeks, J. C., Cook, E. F., O'Day, S. J., Petersen, L. M., Wenger, N., Reding, D., … Phillips, R. S. (1998). Relationship between cancer patients' predictions of prognosis and their treatment preferences. *Journal of the American Medical Association, 279,* 1709-1714.

Yamaguchi, S. (2001). Culture and control orientations. In D. Matsumoto (Ed.), *The Handbook of Culture and Psychology* (pp. 223-243). New York, NY: Oxford University Press.

Yan, H., & Sellick, K. (2004). Symptoms, psychological distress, social support, and quality of life of Chinese patients newly diagnosed with gastrointestinal cancer. *Cancer Nursing, 27,* 389-399.

Yang, L., Parkin, D. M., Li, L. D., Chen, Y. D., & Bray, F. (2004). Estimation and projection of the national profile of cancer mortality in China: 1991-2005. *British Journal of Cancer, 90,* 2157-2166.

Table 1 *Descriptive Statistics of the Study Variables*

	T1 (*n* = 234)		T2 (*n* = 215)		T3 (*n* = 182)	
Variable (range)	α	*M* (*SD*)	α	*M* (*SD*)	α	*M* (*SD*)
Psychological morbidity (0-42)	0.87	11.84 (8.68)	0.92	10.09 (9.46)	0.96	9.34 (10.32)
Physical functioning (0-27)	0.71	22.29 (3.70)			0.78	25.41 (2.26)
Optimism (0-24)	0.76	16.54 (3.30)			0.84	16.23 (3.61)
Hope (0-32)	0.84	23.17 (4.54)			0.74	25.25 (5.16)
Perceived social support (3-12)	0.67	10.63 (1.97)			0.64	11.18 (1.27)
Social relational quality (17-68)	0.88	53.53 (8.11)			0.94	53.38 (9.68)

Table 2 *Means and Standard Deviations of HADS Scores for Change Groups of Physical Functioning and Psychosocial Resources*

		HADS					
		T1		T2		T3	
Group	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Physical functioning							
Loss	20	12.50	8.68	14.10	8.73	18.77	10.28
Stable	90	9.73	9.14	9.51	9.87	8.49	7.76
Gain	124	13.27	8.07	9.86	8.39	8.44	9.01
Optimism							
Loss	91	11.29	9.12	10.30	9.27	13.77	10.30
Stable	68	10.24	7.65	9.37	9.25	7.06	7.54
Gain	75	13.96	8.68	10.48	8.70	6.03	6.34

Hope							
Loss	53	11.00	7.99	10.46	9.78	15.13	10.41
Stable	76	11.13	8.76	10.35	9.50	9.51	8.65
Gain	105	12.78	8.93	9.71	8.42	6.30	7.14
Perceived social support							
Loss	50	11.32	8.57	10.87	8.49	15.40	9.72
Stable	111	9.83	7.52	9.48	9.68	6.14	7.28
Gain	73	15.26	9.43	10.48	8.51	10.06	9.00
Social relational quality							
Loss	78	11.99	8.70	11.74	10.12	13.31	9.38
Stable	79	11.39	8.11	8.83	8.20	9.28	9.15
Gain	77	12.16	9.28	9.71	8.63	5.39	6.84

Note. Loss: at least 0.50 *SD* of decrease; Stable: less than 0.50 *SD* of change; Gain: at least 0.50 *SD* of increase.

Table 3 *Intercorrelation Matrix of the Study Variables*

		1	2	3	4	5	6	7	8	9	10
1	T1 Physical functioning	-	.18**	.18**	.16*	.07	.48***	.10	.13*	.20**	-.07
2	T1 Optimism		-	.56***	.36***	.36***	.22**	.20**	.19**	.13	.04
3	T1 Hope			-	.38***	.42***	.21**	.20**	.26***	.10	.28***
4	T1 Perceived social support				-	.42***	.24***	.24***	.25***	.28***	.22**
5	T1 Social relational quality					-	-.11	.14	.26***	.17*	.42***
6	T3 Physical functioning						-	.29***	.34***	.33***	.29***
7	T3 Optimism							-	.74***	.52***	.57***
8	T3 Hope								-	.51***	.66***

9	T3 Perceived social support	-	.48***
10	T3 Social relational quality		-

Note. T1: n = 234; T3: n = 182.

* p < .05; ** p < .01; *** p < .001

Table 4 *Parameter Estimates and Model Fit Statistics for Growth Mixture Modeling*

	Simple model	Conditional model†
n free parameters	17	47
Log likelihood H0	-2425.44	-2364.78
Akaike information criterion (AIC)	4884.87	4823.56
Bayesian information criterion (BIC)	4943.61	4985.96
Sample size-adjusted BIC (ABIC)	4889.73	4836.99
Entropy indices	0.89	0.90
Class 1	*Delayed distress*	*Delayed distress*
Estimated posterior probabilities	0.90	0.95
n (%)	30 (13%)	24 (10%)
Intercept *M* (*SE*)	10.53 (3.81)**	8.69 (1.53)***
Slope *M* (*SE*)	6.87 (1.49)***	7.84 (0.84)***
Class 2	*Resilient*	*Recovery*
Estimated posterior probabilities	0.97	0.92
n (%)	157 (67%)	37 (16%)
Intercept *M* (*SE*)	7.98 (0.48)***	22.73 (1.72)***
Slope *M* (*SE*)	-1.31 (0.29)***	-8.33 (0.67)***
Class 3	*Chronic distress*	*Resilient*
Estimated posterior probabilities	0.83	0.96

n (%)	16 (7%)	151 (65%)
Intercept *M* (*SE*)	25.29 (5.48)***	7.71 (0.48)***
Slope *M* (*SE*)	-.65 (3.78)	-1.146 (0.29)***
Class 4	*Recovery*	*Chronic distress*
Estimated posterior probabilities	0.90	0.95
n (%)	31 (13%)	22 (9%)
Intercept *M* (*SE*)	24.37 (1.26)***	22.59 (1.89)***
Slope *M* (*SE*)	-8.73 (0.67)***	0.42 (0.99)

Note. † GMM with age, sex, marital status (yes/no), education level, income level, and change groups (loss vs. stability/gain) for physical functioning and psychosocial resources as covariates of class membership.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5 *Medical Characteristics of the Respondents in the Four Classes*

	Total *n* = 234	Delayed distress *n* = 24	Recovery *n* = 37	Resilient *n* = 151	Chronic distress *n* = 22
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Stage†					
I	7 (3%)	0	0	7 (5%)	0
II	47 (20%)	6 (25%)	10 (27%)	26 (17%)	5 (23%)
III	133 (57%)	13 (54%)	15 (41%)	93 (61%)	12 (54%)
IV	47 (20%)	5 (21%)	12 (32%)	25 (17%)	5 (23%)
T2 Rx (Yes/No)	133/84	18/6	20/10	75/64	18/4
T3 Rx (Yes/No)	20/162	5/19	5/24	6/101	4/18
Colostomy at T1	67 (29%)	6 (25%)	12 (32%)	41 (27%)	8 (36%)

Note. † Staging is based on the American Joint Committee on Cancer (AJCC) staging system; Rx = receipt of chemotherapy and/or radiotherapy.

Table 6 *Multinomial Logistic Regressions for Univariate Predictors of Class Membership (in Reference to Chronic Distress)*

	Delayed distress (*n* = 24)					Recovery (*n* = 37)					Resilient (*n* = 151)				
	Estimate	*SE*	OR	95% CI	*p*	Estimate	*SE*	OR	95% CI	*p*	Estimate	*SE*	OR	95% CI	*p*
Age	0.09	0.05	1.10	0.96, 1.25	.084	0.03	0.04	1.03	0.93, 1.15	.432	0.11	.03	1.11	1.02, 1.22	.002
Sex	0.70	1.27	2.01	0.08, 52.17	.582	0.65	0.98	1.92	0.16, 23.93	.504	0.70	0.91	2.02	0.20, 20.93	.438
Marital status	-2.62	1.31	0.07	0.00, 2.12	.046	-2.13	1.23	0.12	0.01, 2.85	.084	-2.30	1.11	0.10	0.01, 1.76	.039
Education level	0.36	0.57	1.44	0.33, 6.27	.526	-0.29	0.54	0.75	0.19, 2.99	.588	0.24	0.40	1.28	0.45, 3.59	.543
Income level	0.86	0.54	2.35	0.58, 9.54	.115	0.78	0.53	2.19	0.56, 8.46	.137	1.19	0.49	3.28	0.92, 11.72	.016
Change groups†															
Physical functioning	3.06	1.31	21.23	0.73, 614.09	.019	1.61	0.82	5.00	0.61, 41.27	.050	0.50	0.57	1.65	0.38, 7.12	.378
Optimism	-0.61	1.03	0.54	0.04, 7.64	.552	1.76	0.56	5.79	1.36, 24.79	.002	0.62	0.48	1.86	0.54, 6.35	.195
Hope	-0.00	0.88	1.00	0.10, 9.71	1.000	1.35	0.63	3.87	0.76, 19.74	.033	0.75	0.42	2.12	0.72, 6.28	.074
Perceived social support	-2.39	1.28	0.09	0.00, 2.47	.042	-0.64	0.65	0.53	0.10, 2.85	.329	-1.19	0.51	0.31	0.08, 1.15	.021
Social relational quality	3.40	1.18	29.90	1.42, 627.79	.004	-0.12	0.55	0.89	0.22, 3.68	.834	0.40	0.35	1.49	0.61, 3.65	.254

Note. OR = odds ratio; CI = confidence interval; † loss vs. stability/gain.

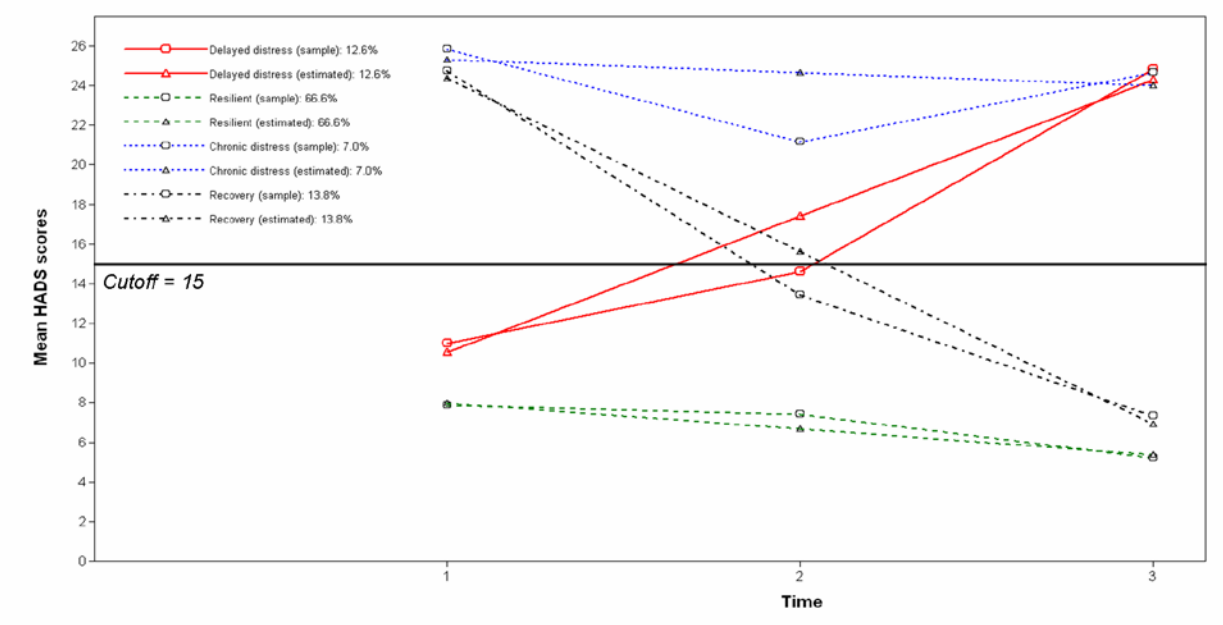

Figure 1. Simple growth mixture model for psychological morbidity (HADS scores) based on sample and estimated means.

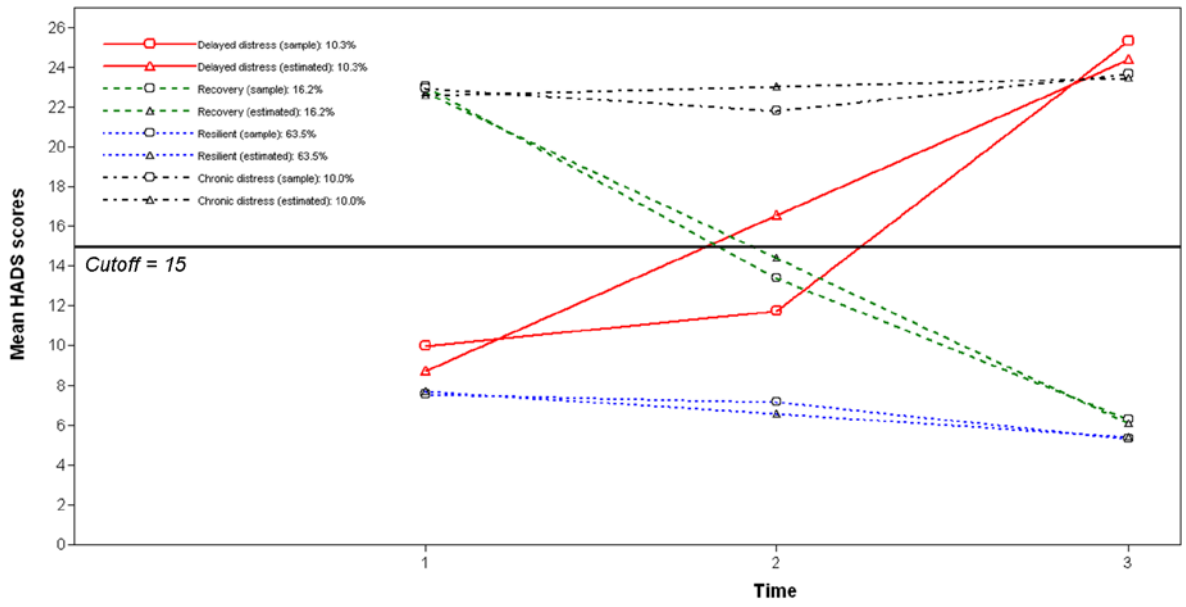

Figure 2. Growth mixture model for psychological morbidity (HADS scores) with resource change groups as covariates based on sample and estimated means.