Social Influence and Children's Sport Experience

by

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Statement of Originality

I, SU, Lin Yi Diana, 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 acknowledgment. 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.



Abstract

Social agents are often regarded as important to the participation and experiences of physical activity (PA) among children and adolescents. However, within the literature, the relationships between parental influences and child and adolescent PA have been inconclusive and discordant. Thus, study 1 adopted a meta-analysis to quantify and synthesize the associations between parental social influences (positive parental influence, punishment, and discouragement) and the PA level of children and adolescents. Through a systematic literature search using the PsycINFO, Web of Science, PubMed, ProQuest, and SPORTDiscus databases, we identified 112 eligible studies and subsequently extracted 741 effect sizes for our analysis. Multilevel meta-analysis showed that the corrected zero-order correlation of positive parental influence was positive and statistically significant, r = 0.202, SE = 0.014, t = 14.975, p < 0.001, 95% confidence interval (CI) = [0.176, 0.228]. Further moderation analysis also found that this was significantly moderated by parental gender (maternal vs. paternal), respondent of influence measure (parent-reported vs. child-reported), and type of PA measure (subjective vs. objective). The corrected zero-order correlations of negative parental influences (i.e., punishment and discouragement) were not statistically significant, and no significant moderation effects were observed. The findings of our meta-analysis showed that children and adolescents had higher PA levels when their parents supported PA participation by exerting positive social influence. Punishment and discouragement against PA by parents did not appear to be significantly associated with the PA level of children and adolescents. Study 2 was a two-wave prospective study that applied the social influence in sport model to investigate whether the social influences of parents, physical education (PE) teachers, and peers were predictive of students' intention to engage in leisure-time physical activity (PA). Participants were 2,484 secondary school students (11 to 18 years old) who completed a questionnaire assessing positive influence, punishment, and dysfunction from the three social



agents at baseline, and PA intention at a 1-month follow-up. Structural equation modelling (SEM) yielded excellent goodness-of-fit and consistent pathways between the three social agents. Students' leisure-time PA intention ($R^2 = .103$ to .112) was positively associated with positive influence (β = .223 to .236, p < .001) and punishment (β = .214 to .256, p < .01), and negatively associated with dysfunction (β = - .281 to -.335, p < .001). Multi-group SEM showed that the predictions were invariant between parents, PE teachers, and peers. Furthermore, no significant differences in students' gender were found between perceived social influence and PA intention. The findings supported the application of the Social Influence in Sport Model in explaining the role of significant others on students' intention to take part in leisure-time PA. Study 3 examined mental toughness (MT), which is an important psychological quality. This two-wave longitudinal study examined whether the social influences of coaches, fathers, mothers and peers were predictive of children's mental toughness in sport contexts. The participants were 112 children (7 to 12 years old) who played basketball at the recreational level in China At baseline and at the 3-month follow-up, they completed a questionnaire measuring their mental toughness and perception of social influences, such as positive influence, punishment, and dysfunction, from the four social agents. The model with correlations between social influence and mental toughness at a change-score level yielded excellent goodness-of-fit using variance-based structural equation modeling (VB-SEM). Children's mental toughness ($R^2 = .37$ to .45) was positively associated with positive influence ($\beta = .228$ to 361, p < .01), and negatively associated with dysfunction $(\beta = -.166 \text{ to } -.367, p < .05)$. Punishment was predicted negatively by social influences from coaches, fathers, and mothers ($\beta = -.182$ to -.247, p < .05), but not peers ($\beta = .049$, p > .05). Multi-group SEM showed that the relationships were invariant between coaches, fathers, mothers and peers. The findings show that children are more likely to have increased mental toughness when significant others exert positive social influence in the sporting environment.



In sum, these three studies aimed to better understand how significant others and social influence types may enhance or inhibit motivational and behavioural outcomes, as well as health development.

Keywords: social influence, intention, mental toughness, children and adolescents, sport and exercise



List of Published Papers from this Thesis

Papers Published

- Su, D. L. Y., Tang, T. C. W., Chung, J. S. K., Lee, A. S. Y., Capio, C. M., & Chan, D. K. C. (2022). Parental influence on child and adolescent physical activity level: A meta-analysis. *International Journal of Environment Research and Public Health*, 19(24), 16861. https://doi.org/10.3390/ijerph192416861 (impact factor 2022 = 4.61)
- Yang, S. X., Cheng, S., & Su, D. L. Y. (2022). Sports injury and stressor-related disorder in competitive athletes: a systematic review and a new framework. *Burns & Trauma*, 10, tkac017. https://doi.org/<u>10.1093/burnst/tkac017</u> (impact factor 2022 = 5.71)
- Su, D. L.Y., Lee, A. S. Y, Chung, J. S. K., Tang, T. C. W., Capio, C. M., Zhang, L., Chan, D. K. C. (2023). Significant others and students' leisure-time physical activity intention: A prospective test of the Social Influence in Sport Model. *Journal of Exercise Science & Fitness*, 21(3), 275-279. https://doi.org/10.1016/j.jesf.2023.04.002 (impact factor 2022 = 3.47)

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List of Abbreviations

PA	physical activity
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SISM	Social Influence in Sport Model
PSISS-2	Perceived Social Influence in Sport Scale-2
EdUHK	The Education University of Hong Kong
MT	mental toughness



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Chapter 1: Introduction

Physical activity (PA) is well documented to benefit physical health (Fox, 2004; Ng et al., 2014; Wang & Lobstein, 2006), mental health (Paluska & Schwenk, 2000), and social well-being (Biddle & Asare, 2011). However, physical inactivity among children and adolescents is now commonly reported worldwide (World Health Organization, 2019). In the sport and exercise psychology literature, there has been extensive research on the role of social agents in youth sport participation. Over the years, researchers have applied various psychological frameworks (e.g., Achievement Goal Theory; Ames, 1995; Self-Determination Theory; Bartholomew et al., 2011) to explain how social influences from parents, coaches, physical education (PE) teachers, and peers are related to children's and adolescents' behaviour and experience in sports (Chan, Keegan, et al., 2019). The social influences fostered by significant others have been linked to various motivational and behavioural outcomes of children and adolescents in sports, such as effort, competence, enjoyment, and anxiety (Chan, Keegan, et al., 2019). However, the current literature related to social influence on children's sport participation and experience has been inconsistent because of the differences in the theoretical frameworks of social influence, so the findings have been mixed and preclude a complete understanding of the role of social influence on children's experience in sports. Specifically, according to competence motivation theory (Harter, 1978), significant others such as parents, coaches, and teammates may exert positive (eg, approval, and support) or negative (eg, disapproval, and criticism) feedback to children's sporting behaviors. This influence affects children's perceptions of their competence, affect, and quality of motivation (Harter et al., 1996) (Harter et al., 1996). The critical view that the quality or content of the feedback may be just as important as its valence that is, whether it is positive or negative, and that there are additional factors—such as the manner of instruction or communication—that



may have an impact on children's sporting experiences has, however, been disputed. The understanding of the perceived motivational climates and its link with achievement goal orientation and behavioral patterns is central to achievement goal theory's viewpoint on social influence (Ames, 1995). However, few research compares the motivating climates of different socializing agents in a systematic way (Vazou et al., 2006; White et al., 1998). Meanwhile, self-determination theory (Miller et al., 1988) is another popular theory for explaining societal influence in sports. Whereas less emphasis has been focused on the involvement of parents and teammates, and there has been little research of the validity and predictive power of the measures among social agents (Hagger et al., 2007). In conclusion, due to a former emphasis on social influence from a specific social agent, prior studies might not necessarily explore the relative importance of significant others or did not comprehensively examine comparable aspects of social influences, including all important social agents.

To address this limitation, Chan and colleagues (2019) proposed a 2x2 framework (and assessment tool) of social influence to provide a better understanding of how significant others (e.g., parents and sport instructors/coaches) may influence children's sport experience. In the model of Social Influence in Sport Model (SISM), significant others may exert three types of social influences on children, including positive influence, punishment, and dysfunction, each differing by the valence and conditionality of the construct. Positive influence consists of two factors: positive reinforcement (defined as positive and conditional influence, including encouragement, positive emotions, etc.) and affiliation (defined as positive and unconditional influence, including affection, supportiveness, understanding, etc.). Punishment is defined as negative and conditional influence, including criticism, disappointment, negative reaction, etc. Dysfunction is defined as conflicts, disharmony and negative behavior, etc.

In general, Chan and colleagues applied SISM and discovered that positive influence from



significant others was associated with children's beneficial behaviour and motivational outcomes, such as competence, enjoyment, effort, psychological need support and less anxiety in sport, and positive influence was positively associated with psychological need support. However, unfavorable patterns were connected to dysfunction and punishment (Chan, Keegan, et al., 2019).

Thus, given the focus of the empirical studies on leisure-time PA and recreational sports, the research question of my doctoral thesis is as follows: what are the social influence roles on children's PA participation? The first study is to quantify and summarize the relationship between parental influence and PA level. Previous studies have examined the types and characteristics of recipients and the effects of parental support on PA in children and adolescents (Beets et al., 2010; Edwardson & Gorely, 2010; Trost & Loprinzi, 2011). However, these reviews ignored negative ways of social influence, including punishment and discouragement. Second, the goal of the thesis is to validate and apply the concepts of SISM and understand how these three types of social influence may predict or exert influence on children's sports experience (intention) and psychological outcomes (mental toughness; which is always regarded as the most important psychological attribute in dealing with obstacles (Bell et al., 2013), managing the potential of negative emotions (Aryanto & Larasati, 2020), determining successful performance (Gould et al., 2002) and accomplished tasks (Aryanto & Larasati, 2020) in sports and PA settings.) over time. Previous studies have been looking at the beneficial role of PA on mental health (Bell et al., 2019; Biddle & Asare, 2011) and quality of life (Gopinath et al., 2012; Wu et al., 2017) among young athletes; nevertheless, how social influence could function on health-related outcomes in the context of PA is limited. Meanwhile, comparisons are made between multiple social agents (e.g., parents, coaches, and peers). Prior research examining the role of significant others has centered on the context of a competitive sport setting and focused on certain social agents individually. There was limited



research that examined the relative role of one social agent (e.g., parents) to that of another (e.g., teachers) in a leisure-time PA setting. In summary, the overall aim of my doctorial study is to apply the 2x2 conceptualisation of social influence in sport, outlined in SISM (Chan, Keegan, et al., 2019), to obtain a better understanding of how significant others and influence types may optimise or impair sports experience and behaviours and health development in young people's leisure-time PA context. There are a total of 3 studies in my doctoral thesis: Study 1 examines the relationships between positive and negative parental influence and children's and adolescents' PA level, and Study 2 and Study 3 applied the SISM and related concepts to reveal how parents, peers, and teachers/coach coaches may exert their influence on the PA levels and sport experience of young people.

Study 1 (Chapter 2) aims to meta-analyse the literature on the impact of social influence from parents on children's and adolescents' PA levels. Specifically, Study 1 will be set out to answer (a) the magnitude of the overall association between different types and sources of social influence and PA level and (b) whether the relationship between social influence and PA holds stable across child age group, child gender, parental gender, respondent of parental influence, and the type of PA measurement.

Study 2 (Chapter 3) particularly looks at leisure-time PA and examines the role of parents, teachers, and classmates on students' intention in this situation. Thus, this research addresses the research gaps in the literature regarding significant others' roles in young children's behaviour and the decision-making factors of leisure-time PA.

Study 3 (Chapter 4) is a longitudinal study that focuses on examining how social influence from significant others in basketball sports is predictive of children's mental toughness. This study aims to address the research gaps in the literature in understanding the role of significant others on young athletes' health and well-being.



Chapter 2: Parental Influence on Child and Adolescent Physical Activity Level: A Meta-Analysis

This chapter is a modified form of the following published article:

Su, D. L. Y., Tang, T. C. W., Chung, J. S. K., Lee, A. S. Y., Capio, C. M., & Chan, D.K.C. (2022). Parental influence on child and adolescent physical activity level: A meta-analysis. *International Journal of Environment Research and Public Health*, 19(24), 16861. https://doi.org/10.3390/ijerph192416861 (impact factor 2022 = 4.61)



Summary of Chapter 2

The purpose of study 1 is to meta-analyse, quantify and synthesize the associations between parental social influences (positive parental influence, punishment, and discouragement) and the PA level of children and adolescents. Through a systematic literature search using the PsycINFO, Web of Science, PubMed, ProQuest, and SPORTDiscus databases, we identified 112 eligible studies and subsequently extracted 741 effect sizes for our analysis. Multilevel meta-analysis showed that the corrected zero-order correlation of positive parental influence was positive and statistically significant, r = 0.202, SE = 0.014, t = 14.975, p < 0.001, 95% confidence interval (CI) = [0.176, 0.228]. Further moderation analysis also found that this was significantly moderated by parental gender (maternal vs. paternal), respondent of influence measure (parent-reported vs. child-reported), and type of PA measure (subjective vs. objective). The corrected zero-order correlations of negative parental influences (i.e., punishment and discouragement) were not statistically significant, and no significant moderation effects were observed. The findings of our meta-analysis showed that children and adolescents had higher PA levels when their parents supported PA participation by exerting positive social influence. Punishment and discouragement against PA by parents did not appear to be significantly associated with the PA level of children and adolescents. Punishment and discouragement against PA by parents did not appear to be significantly associated with the PA level of children and adolescents. The findings of negative parental social influence were mixed and required further investigation.



2.1 INTRODUCTION

Since children spend the majority of their formative years with their parents, parents have been recognised as a significant socialization agent (Lau et al., 1990). Furthermore, parents are often regarded as one of the direct and primary providers of health information and education (Hopper et al., 1992) and one of the significant social agents for promoting a physically active lifestyle among children and adolescents (Gubbels et al., 2011; Lennart Raudsepp, 2006). Our study aims to conduct a meta-analysis that synthesizes the research findings thus far regarding the relationship between parental influence and the PA level of children and adolescents. We created a framework to analyse the different types of parental impact following the valence of the Social Influence in Sport Model (SISM; Chan, Keegan, et al., 2019), that is, positive influence and negative influence. As a result, we can better understand how parental influence affects children and adolescents' PA levels, either positively or negatively.

2.1.1 Positive and negative parental influences

Parental influence on children's PA encompasses multidimensional mechanisms, including parental attitudes, beliefs, and values toward PA (Dempsey et al., 1993) and social support (Trost et al., 2003). Parents are believed to exert their social influence on child and adolescent PA patterns through their encouragement (Crimi et al., 2009), logistic support (L. Raudsepp, 2006), role modeling (Nikolaidis, 2011), parent–child play (Rosenkranz & Dzewaltowski, 2011), family communication (Kobayashi et al., 2019) and general social support (Rees & Freeman, 2010). Parents may shape their children's habits and actual involvement in PA by exerting influence in the sporting environment (Beets et al., 2010; Chiarlitti & Kolen, 2017). Given the importance and complexity of parental influence on PA, a large volume of studies has examined the role of parental support on child and adolescent



PA (Beets et al., 2010; Edwardson & Gorely, 2010; Leung et al., 2017; Trost & Loprinzi,2011). It is generally found that the provision of positive parental support was associated with higher PA levels among children and adolescents.

Indeed, research regarding the relationship between parental influence and child PA has primarily focused on positive social influence from parents (Beets et al., 2010; Edwardson & Gorely, 2010; Trost & Loprinzi, 2011). In comparison to positive parental influence, research into negative parental influence on child and adolescent PA has received far less attention in the literature. Negative parental influence is often exhibited in two forms: punishment and discouragement. Punishment is a negative parental influence characterized by forcing children to participate in PA or forcing them to perform better in sport/exercise by using coercive instruction styles, implementing excessive parental control, or applying pressure (Chan, Keegan, et al., 2019; Liszewska et al., 2018; Wilson & Spink, 2012). Discouragement is a negative type of parental influence that is defined as parental behaviors or verbalizations, such as disapproval of PA, restricting outside play or against their children participating in PA (Crespo et al., 2013; Loprinzi et al., 2013). Within the limited pool of research, studies have generally reported mixed findings on the relationship between negative parental influences and the PA levels of children and adolescents. Previous studies reported relationships that are either nonsignificant (Crespo et al., 2013; Liszewska et al., 2018; McMinn et al., 2013), positive (Saunders et al., 2012), or negative (Lloyd et al., 2014; McMinn et al., 2013), which could be dependent on the type of negative parental influences, the specification of the sample, and the measures of PA levels.

To better understand how parents can promote the PA levels of children and adolescents, it is important that research scrutinizes and synthesizes the discordant findings on negative parental influence and compares the findings against those of positive parental influence.



2.1.2 Current reviews about parental influence

Previous reviews (Beets et al., 2010; Edwardson & Gorely, 2010; Trost & Loprinzi, 2011) have summarized the research findings of how parental influences are related to child and adolescent PA levels. However, these studies mainly focus on positive parental influence, such as social support by parents. For example, the systematic review by Edwardson and Gorely (2010) only covers studies related to social support from parents in terms of parental modeling, involvement, overall support, encouragement, and support in transportation. A systematic review by Beets and colleagues (2010) investigates studies on social support from parents. Some of this was tangible support, such as supervision/accompaniment and instrumental support, and some was intangible support, such as encouragement/praise and provision of information. Yao and Rhodes (2015) performed a meta-analysis on parental modeling and support. Despite differences in the conceptualization of social support, both reviews only looked at the positive side of parental influence on PA and ignored aspects of negative parental influence, such as verbal pressure and restrictions. This precludes a complete understanding of parental influence on child and adolescent PA levels.

To the best of our knowledge, the only review in the literature that covers aspects of negative parental influence on PA levels is the systematic review by Lindsay and coworkers (Lindsay et al., 2018). Their analysis (Lindsay et al., 2018) identified and discussed a few studies on how parents applied negative social influence on children's and adolescents' PA levels, such as the implementation of rules and restrictions and applying psychological control. The findings supported that there would be a negative or nonsignificant connection between negative parental influence and PA level. However, the review only included studies on Latino children in the United States. Moreover, their conceptualization of negative parental influence was restricted to how parents hindered or prohibited children from taking part in PA and did not include promoting PA in a coercive way (Lindsay et al., 2018).



In conclusion, existing reviews reveal a wealth of literature investigating parental influence on children's and adolescents' PA. However, these reviews do not examine whether parents promote PA to their children using positive or negative techniques. Moreover, the findings from these systematic reviews are unable to statistically quantify the effect sizes of the relationship between parental influence and PA. Furthermore, potential moderators of such effects, such as age, gender, parental gender, and type of PA measures, remain unresearched.

2.1.3 The present study

To address the research gaps in the literature, we present a meta-analysis that synthesizes the findings on the extent to which positive and negative parental influence are related to the PA level of children and adolescents. Based on the key findings of the literature on positive and negative parental influences (Chan, Keegan, et al., 2019; Chan et al., 2012) and the evidence from systematic reviews (Beets et al., 2010; Edwardson & Gorely, 2010; Trost & Loprinzi, 2011), we examine the following research questions:

(Q1) What is the association between positive parental influence and the PA level of children and adolescents?

(Q2) What is the association between negative parental influence styles of punishment and discouragement, and the PA level of children and adolescents?

(Q3) Whether or not the associations identified in Q1 and Q2 hold in different study characteristics, such as child age group, child gender, parental gender, respondent of parental influence, and the type of PA measurement.

2.2 Methods

2.2.1 Literature search



We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (Moher et al., 2015) as a guide to conduct this meta-analysis. Descriptions, aims and hypotheses of this meta-analysis were preregistered at PROSPERO with ID CRD42021267072. This review article focuses on the relationships between parental influence and the PA levels of children and adolescents. A literature search was conducted in April 2020 using the PsycINFO, Web of Science, PubMed, ProQuest, and SPORTDiscus databases. A combination of Boolean keywords related to the PA and parental influence of healthy children and adolescents were used as the search terms. The specific keywords can be found in Appendix A in the supplementary material.

2.2.2 Inclusion and exclusion criteria

Our systematic search aimed to identify all studies published up to April 2020 that met the inclusion and exclusion criteria. Studies were included if:

- (1) Sample measured children or adolescents under 18 years of age
- (2) Samples were healthy individuals (i.e., no known physical or mental conditions).
- (3) PA level was measured
- (4) Positive or negative PA-specific parental social influence was measured.
- (5) They were quantitative in nature
- (6) They were published in English peer-reviewed journals

We excluded opinion articles, reviews, commentaries, and unpublished papers (e.g., student theses) from our review.

2.2.3 Search and data extraction procedure

In the initial search, 3,919 articles were identified. After removing 1,238 duplications, a total of 2,681 records remained for title-and-abstract screening based on the inclusion and



exclusion criteria. After excluding 2,572 studies (reasons are displayed in the PRISMA diagram of Figure 1), a total of 112 studies remained for the current meta-analysis with 714 effect sizes (i.e., zero-order correlation coefficients) extracted regarding the relationships between parental influence and PA levels of children and adolescents.

2.2.4 Classification and study quality assessment

Apart from the effect sizes, two independent coders extracted key study variables and assessed study quality. The study characteristics were coded as follows:

- parental influence type (i.e., positive influence vs. punishment vs. discouragement)
- child age group (i.e., children vs. adolescents)
- child gender (i.e., male vs. female)
- parental gender (maternal vs. paternal)
- respondent of parental influence (i.e., child-reported vs. parent-reported)
- type of PA measurement (i.e., objective vs. subjective)

Specific definitions of the classifications can be found in Appendix B (Table 1, 2 and 3). For the assessment of study quality, we applied the Revised Risk of Bias Assessment (Higgins & Altman, 2008) tool by Ntoumanis and colleagues (Ntoumanis et al., 2014). The study was considered to be either 'low risk' or 'having a potential risk of bias',



Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart used to identify studies for detailed analysis of parental influence and PA level.





depending on whether the study could fulfill the 15 assessment criteria of study quality outlined by the tool (Ntoumanis et al., 2014). Two raters discussed and resolved any disagreement in their classifications and scoring until a consensus was reached. Detailed study quality assessment can be found in Appendix C (Table 4 and 5).

2.2.5 Multilevel Meta-Analysis

We conducted a multilevel meta-analysis using the Metafor package (Viechtbauer, 2010) in R and RStudio (R Core Team, 2013). This method was suitable for our study because we had to extract multiple effect sizes from a single study that had more than one measure of parental influence or PA level. We were also able to statistically control for the nested effects of sample dependency between related effect sizes. In this case, our analysis did not violate the assumption of independent observations from traditional univariate meta-analysis, and more importantly, we were able to achieve higher statistical power by maximizing the available information.

In particular, our multilevel meta-analysis followed a three-level random-effects model (Assink & Wibbelink, 2016):

- at level 1, we accounted for sampling variance (participant sampling);
- at level 2, we accounted for within-study variance;
- at level 3, we accounted for between-study variance (Cheung, 2014; Van den Noortgate et al., 2013).

We examined Q1 and Q2 in 2 steps. In Step 1, we examined the overall effect sizes. In Step 2, we tested the heterogeneity of overall effect sizes by applying a likelihood-ratio test based on the distribution of within-study variance, between-study significance, and sampling variance over the three levels of our meta-analytic model. If less than 75% of the total variance could be attributed to the sampling variance, we proceeded to Step 3, where we



tested H3. Here, we conducted moderation analysis to examine whether the overall effect sizes were moderated by our coded classification of the study characteristics/effect sizes (Hunter & Schmidt, 2004). As Fisher's z is the default effect size for the multilevel meta-analysis using the Metafor package (Viechtbauer, 2010), we followed the procedures of previous studies (Ling et al., 2020; Sakaluk et al., 2020) in converting zero-order correlations to Fisher's z for the analysis and vice versa to simplify the interpretation of study findings.

In addition to multilevel meta-analysis, we also evaluated whether publication bias (Lipsey & Wilson, 2001; Torgerson, 2006) inflated our meta-analysed effect sizes by conducting Egger's test and funnel plot using Fisher's z transformations (Egger et al., 1997). A significant Egger's test statistic and an asymmetrical funnel plot will indicate a presented risk of publication bias, and therefore, more cautious interpretation would be needed.

2.3 Results

2.3.1 Quality of Studies

The majority of included studies (k = 72) were rated low risk in each assessment item, and 40 studies had potential risks of biases (18 studies concerning the method, 22 studies concerning the results section). More detailed item-by-item ratings can be found in Appendix C.

2.3.2 Descriptive statistics

A total of 112 studies and 714 effect sizes were included in the current meta-analysis. The total sample size was N = 943,448, with study sample sizes ranging from N = 30 (Klesges et al., 1986) to N = 81,857 (Liu et al., 2017). The overall sample mean age was 10.91 years old. The majority of studies (k = 95) were cross-sectional in design, and other studies were longitudinal research (k = 15), experimental or intervention studies (k = 1) and prospective



studies (k = 1). The majority of the literature focused on positive influence (k = 111), and only a few studies (k = 5) were related to the punishment of parental influence and to the discouragement of parental influence (k = 4). There were studies that included both males and females as children and adolescent samples (k = 91), while some studies (k = 12) only looked specifically at female samples. There was no study focusing on a male-only sample, and only a few studies did not report the gender proportion (k = 9). In terms of parental gender, most studies adopted the concept of parents without distinguishing between paternal and maternal influence (k = 76), while some studies concentrated on paternal influence (k = 31), and others focused on maternal influence (k = 35). For the coding of the respondent of influence measure, there were slightly more studies (k = 71) using parent-reported than child-reported parental influence (k = 50). Studies were also coded with subjective measurements (k = 84) and objective measurements (k = 35) of PA.

2.3.3 Publication bias

Egger's tests indicated that no significant publication bias was detected in positive parental influence (z = 0.144, p = 0.886), punishment (z = -1.757, p = 0.079), and discouragement (z = 0.372, p = 0.710). Figures 2, 3 and 4 illustrate the associations between PA level and positive, punishment and discouragement parental influence, respectively.







Figure 3. Funnel plot for the associations between punishment parental influence and PA level



Figure 4. Funnel plot for the associations between discouragement parental influence and PA level





2.3.4 Main overall effect (Q1 and Q2)

2.3.4.1 Overall effect size of positive parental influence

The main overall effect size of positive influence was statistically significant (r = 0.202, SE = 0.014, t = 14.975, p < 0.001, 95% CI = [0.176, 0.228]), with substantial heterogeneity (Q_E(686) = 12,259.262, p < 0.001). The variance at the within-study level (p < 0.001) and the between-study level (p < 0.001) were both significant. Follow-up analyses concluded that variance at the sampling, within-study, and between-study levels was 3.02%, 33.00%, and 63.97%, respectively. Since the percentage of total variance attributed at level 1 is less than 75%, further moderation analysis is meaningful (Hunter & Schmidt, 2004).

2.3.4.2 Overall effect size of punishment

The main overall effect size of the punishment did not reach statistical significance (r = 0.096, SE = 0.109, t = 0.881, p = 0.396, 95% CI = [-0.141, 0.322]), with substantial heterogeneity ($Q_E(12) = 348.475$, p < 0.001). The variance did not reach significance (p = 0.182) at the within-study level; however, it reached significance (p < 0.001) at the between-



study level. Follow-up analyses concluded that variance at the sampling level, within-study level and between-study level was 1.32%, 3.39%, and 95.28%, respectively. Because the proportion of total variation ascribed at the sampling level is less than 75%, further moderation analysis is meaningful (Hunter & Schmidt, 2004).

2.3.4.3 Overall effect size of discouragement

The overall effect size regarding discouragement failed to reach statistical significance (r = -0.063, SE = 0.035, t = -1.789, p = 0.117, 95% CI = [-0.145, 0.020]), with substantial heterogeneity ($Q_E(7) = 24.381$, p < 0.001). The variance at the within-study level p < 0.001 and the between-study level p < 0.001 were both significant. Follow-up analyses concluded that variance at the sampling level, within-study level and between-study level was 1.29%, 68.42%, and 15.40%, respectively. Potential meaningful moderation analysis could be conducted because the percentage of total variance attributed at the sampling level is less than 75% (Hunter & Schmidt, 2004).

2.3.5 Moderator analysis (Q3)

2.3.5.1 Sample demographics

First, we tested the demographic moderators of age and gender in positive, punishment and discouragement influence models. Neither age ($Q_E(489) = 8,082.320, p < 0.001, F(1, 489) = 0.253, p = 0.615$), nor gender ($Q_E(653) = 12,088.451, p < 0.001, F(1, 653) = 0.604, p = 0.437$) was a significant moderator of the relationship between positive parental influence and PA level. The same was observed in punishment, where age ($Q_E(11) = 228.024, p < 0.001, F(1, 11) = 1.297, p = 0.279$) and gender ($Q_E(11) = 346.680, p < 0.001, F(1, 11) = 0.412, p = 0.534$) did not significantly moderate the relationship. Similar patterns were also found in discouragement, where age ($Q_E(5) = 22.498, p < 0.001, F(1, 5) = 0.077, p = 0.792$)



and gender ($Q_E(5) = 22.532$, p < 0.001, F(1, 5) = 0.144, p = 0.720) did not significantly moderate the relationship between discouragement and PA level. This suggests that the relationship between parental influence (positive influence/punishment/discouragement) and PA remained stable across different ages and genders of children.

2.3.5.2 Parental gender

Parental gender had two categories. Effect sizes of maternal/paternal influence were accounted for in the positive influence (k = 30)/(k = 34), punishment (k = 1)/(k = 1) and discouragement (k = 0)/(k = 0). For the relationship between positive parental influence and PA level, parental gender was a significant moderator (Q_E (251) = 1,773.112, p < 0.001, F(2, 251) = 55.907, p < 0.001). However, paternal influence ($\beta = 0.203$, S.E. = 0.020, t = 10.565, p < 0.001, 95% CI = [0.168, 0.240]) showed similar effects to maternal influence ($\beta = 0.180$, S.E. = 0.019, t = 9.460, p < 0.001, 95% CI = [0.143, 0.217]), indicating significance. For the relationship between punishment and PA level, parental gender did not moderate the effect between parental influence and PA level (Q_E (0) = 0.000, p = 1.000, F(2, 1) = 2.199, p = 0.43). For the relationship between discouragement and PA level, there were not enough studies that distinguished between paternal-only and maternal-only influence, so we were unable to conduct a moderation analysis for discouragement.

2.3.5.3 Respondent of parental influence (parent-reported measures/child-reported measures)

For respondents of parental influence, the effect sizes of parent-reported measures/childreported measures were accounted for in the positive influence (k = 53)/(k = 47), punishment (k = 10)/(k = 3) and discouragement (k = 8)/(k = 0) for moderation analysis. For the relationship between positive parental influence and PA level, the respondent of parental



influence was a significant moderator ($Q_E(685) = 11,227.767, p < 0.001, F(2, 685) = 116.372, p < 0.001$). Both child-reported measures and parent-reported measures were significant. However, compared with child-reported measures ($\beta = 0.148$, S.E. = 0.017, t = 8.641, p < 0.001, 95% CI = [0.114, 0.181]), parent-reported measures had significantly stronger positive correlations with PA level ($\beta = 0.235$, S.E. = 0.016, t = 15.239, p < 0.001, 95% CI = [0.206, 0.265]). For the relationship between punishment and PA level, the respondent of parental influence was not found to be a significant moderator ($Q_E(11) = 323.908, p < 0.001, F(2, 11) = 0.330, p = 0.726$). For the relationship between discouragement and PA level, we were unable to conduct a moderation analysis due to an inadequate number of relevant effect sizes.

2.3.5.4 Type of PA measure

For the type of PA measure moderator, the effect sizes of subjective measurement methods/objective measurement methods were accounted for in the positive influence (k = 21)/(k = 77), punishment (k = 11)/(k = 2) and discouragement (k = 3)/(k = 5). For the relationship between positive parental influence and PA, the type of PA measure was a significant moderator (Q_E (685) = 12,257.973, p < 0.001, F(2, 685) = 121.879, p < 0.001). Both subjective (β = 0.218, S.E. = 0.015, t = 15.135, p < 0.001, 95% CI = [0.191, 0.246]) and objective measures (β = 0.154, S.E. = 0.022, t = 7.118, p < 0.001, 95% CI = [0.113, 0.195]) were significant moderators. On the other hand, the type of PA measurement did not significantly moderate the relationship between punishment and PA (Q_E (11) = 334.874, p < 0.001, F(2, 11) = 0.786, p = 0.480) or the relationship between discouragement and PA (Q_E (6) = 23.499, p < 0.001, F(2, 6) = 0.645, p = 0.557).

2.4 Discussion

This three-level meta-analysis aimed to synthesize the findings of the literature regarding



the extent to which positive and negative parental influences, such as positive influence, punishment and discouragement, were related to the PA levels of children and adolescents (under the age of 18). A total of 112 studies and 714 effect sizes were analysed based on the total sample size of N = 943,448.

Our meta-analysed associations may answer the three research questions regarding the relationships between parental influence and children's PA level. For Q1, positive parental influence was positively and significantly associated with the PA level of children and adolescents. For Q2, the two negative parental influences of punishment and discouragement were not significantly linked to the PA level of children and adolescents. For Q3, the association between positive parental influence and PA level was significantly moderated by parental gender, respondent of parental influence measure, and type of PA measure.

In sum, the findings showed that the relationship between parental influence and the PA level of children and adolescents was dependent on the type of parental influence that children are subject to. The role of positive parental influence was shown to be adaptive and robust, but that of negative parental influence, i.e., punishment and discouragement, appeared to be nonsignificant.

2.4.1 Positive parental influence

Our results showed that positive parental influences are positively related to child and adolescent PA levels with small to medium effects. This is consistent with the findings of previous meta-analyses that investigated the support of parents on children's and adolescents' PA levels (Laird et al., 2016; Yao & Rhodes, 2015). Moderation analyses of our metaanalysed effect sizes also showed that the correlation between positive parental support and PA level was generally consistent across different sampling characteristics, such as child age group and child gender. This pattern of results concurs with the findings of previous



systematic reviews (Edwardson & Gorely, 2010; Trost & Loprinzi, 2011) and a previous study about PA and child gender (Lijuan et al., 2017). This may indicate that positive parental influence is equally important for children and adolescents of both genders with regard to PA participation. However, a few significant moderation effects were observed in other study characteristics: parental gender, respondent of parental influence, and the type of PA measurement. These warrant further discussion.

2.4.2 Moderators of positive parental influence

Our findings show that parental gender significantly moderates the relationship between positive parental influence and PA level but is not different between mothers and fathers. This is in agreement with the findings of the meta-analysis by Laird and colleagues (Laird et al., 2016). As such, our findings do not concur with the view that fathers and mothers have different roles in influencing their children's participation in PA (Wilson & Dollman, 2007) or sports (Chan et al., 2012). This could be the case since both parents are accountable for supporting their children's PA (Solomon-Moore et al., 2018).

Moderation analysis shows that positive parental influence is more significantly correlated with PA level when the evaluation is parent-reported than when it is child-reported. It is plausible that parents have a better understanding of the social support they offer to their children in terms of PA participation (Pugliese & Tinsley, 2007), resulting in a stronger correlation with PA level due to reduced measurement error.

Nevertheless, our moderation analysis shows that there is no significant difference when measuring PA objectively versus subjectively in the relationship between positive parental influence and PA, although this finding contradicts the theory that participants may overestimate or underestimate the amount of PA (Sirard & Pate, 2001). One possibility is that individuals are able to properly recall their level of PA, especially with increasing age



(Gwynn et al., 2010), and evidence shows that the self-report and accelerometer data are moderately to highly correlated (Ridgers et al., 2012).

Overall, our moderation analyses have shown that the positive relationship between positive parental influence and the PA level of children and adolescents is generally robust against the variation in sample/study characteristics. However, the respondent of parental influence appears to affect the strength of the relationship.

2.4.3 Negative parental influences and moderation

In terms of negative parental influence, our meta-analysis showed that punishment and discouragement were not significantly correlated with the PA level of children and adolescents. These findings conflict with the literature's general perspective that controlling parenting styles or negative parenting practices, such as rule setting and psychological control, can discourage children's motivational and behavioral patterns of PA (Lindsay et al., 2018; O'Rourke et al., 2011; Sánchez-Miguel et al., 2013).

Similarly, it has been argued in the literature that negative parental influence, such as punishment or negative feedback, can be perceived as constructive criticism (Chan et al., 2012; Cushman et al., 2019). Adolescents are more likely to perceive this than children, as they are more cognitively mature and thus can understand the motivation behind the criticism (Chan et al., 2012). Indeed, our study does not reveal a significant moderation effect of age on the relationship between punishment and PA level; however, this could be because of the small sample size of punishment-related studies (k = 5), which reduced the statistical power of the moderation analysis. Similarly, the nonsignificant relationship between discouragement-related studies (k = 4). Such a finding could imply that children's PA level is unlikely to be reduced by parental disapproval. Perhaps it was that our meta-analysis did not differentiate


where PA was taken place, so the role of parental discouragement on PA could be different between school-based or leisure-time PA. It is therefore important that studies take the influence of school or PE teachers into account when they evaluate the role of parents on child PA levels (Chan, Keegan, et al., 2019; Chan et al., 2012).

Overall, it appears that the research findings regarding the role of negative parental influence on children's PA levels are mixed and inconclusive. As such, future studies should investigate how parental punishment and discouragement impact the volume and behavioural patterns of children's PA both in school and out of school.

2.4.4 Limitations and future directions

First, our investigation only focuses on the association between parental influence and the PA level of children and adolescents. The majority of the studies we identified from the literature were cross-sectional. Without longitudinal studies, the meta-analysed correlations reported in our study are unable to make any causal or temporal inferences.

Second, the sample sizes of certain subgroups that we coded for our moderation analyses were relatively small. This is because the included studies were often not able to differentiate the effect sizes between the categories (e.g., paternal vs. maternal influence), or the number of studies that fell within the coding classifications of certain moderators was limited (e.g., discouragement). As such, small sample sizes reduced the statistical power of our meta-analysis to detect significant differences between subgroups. They also precluded our ability to conduct moderation analysis for interactive moderation effects of two or more moderators.

Third, a large volume of studies examines the parental influence on children's psychological patterns of PA participation, e.g., enjoyment (Shen et al., 2018), motivation (McDavid et al., 2012), intention (Hamilton & White, 2012), and commitment (Weiss & Weiss, 2007). However, these were excluded from our meta-analysis because they did not have a



behavioral measure of PA level. Therefore, our findings were exclusive to how parental influence was linked to PA level, instead of the psychological patterns of children and adolescents in PA contexts. Future meta-analyses or systematic reviews should synthesize the research findings of parental influence and psychological factors in PA participation of children and adolescents.

Last, the mixed findings of negative parental influence may suggest that more studies are required to scrutinise the role of parental negative influences on children and adolescents from PA. The literature has documented parental concerns about safety, availability of time, and the importance of academic performance as common barriers that prevent children and adolescents from participating in PA (Ling et al., 2016; Owen et al., 2016; Solana et al., 2018). It is highly important that future studies examine how parents cope with these barriers and preserve the PA level of their children.

2.5 Conclusion

This meta-analysis is a comprehensive summary of the association between parental influence and the PA level of children and adolescents. To the best of our knowledge, this is the first meta-analysis in the literature that focuses on both positive and negative parental influences, and their associations with the PA level of children and adolescents. Our findings support the view that the PA level of children and adolescents is more likely to be higher when they receive approval, support/assistance, and recognition/reward from their parents, which answered Q1. In Q2, there was no significant correlation between children's and adolescents' PA levels and the two negative parental influences of punishment and discouragement. Parental gender, the responder of the parental influence measure, and the kind of PA measure all significantly moderated the link between positive parental influence and PA level for Q3. Our current study may serve as a foundation to understand and answer how parents and their influence types may optimise or impair PA behaviors.



Chapter 3: Significant Others and Students' Leisure-Time Physical Activity Intention: A Prospective Test of the Social Influence in Sport Model

This chapter is a modified form of the following published article:

Su, D. L.Y., Lee, A. S. Y, Chung, J. S. K., Tang, T. C. W., Capio, C. M., Zhang, L., Chan, D. K. C. (2023). Significant others and students' leisure-time physical activity intention: A prospective test of the Social Influence in Sport Model. *Journal of Exercise Science & Fitness*, 21(3), 275-279. https://doi.org/10.1016/j.jesf.2023.04.002 (impact factor 2022 = 3.47)



Summary of Chapter 3

This two-wave prospective study applied the Social Influence in Sport Model to investigate whether the social influences of parents, physical education (PE) teachers, and peers were predictive of students' intention to engage in leisure-time physical activity (PA). Participants were 2,484 secondary school students (11 to 18 years old) who completed a questionnaire assessing positive influence, punishment, and dysfunction from the three social agents at baseline and PA intention at a 1-month follow-up. Structural equation modelling (SEM) yielded excellent goodness-of-fit and consistent pathways between the three social agents. Students' leisure-time PA intention (R² = .103 to .112) was positively associated with positive influence (β = .223 to .236, p < .001) and punishment (β = .214 to .256, p < .01), and negatively associated with dysfunction (β = - .281 to -.335, p < .001). Multi-group SEM showed that the predictions were invariant between parents, PE teachers, and peers. Furthermore, no significant differences in students' gender were found between perceived social influence and PA intention. The findings supported the application of the Social Influence in Sport Model in explaining the role of significant others on students' intention to take part in leisure-time PA.



3.1 Introduction

PA has been shown to be associated with positive physical and psychological outcomes in adolescents (Strong et al., 2005; Yao & Rhodes, 2015); therefore, promoting a physically active lifestyle for adolescence is of utmost importance. However, the social environment created by social agents such as parents, coaches/PE teachers and peers could be important to adolescents' participation and experience in PA. These social environments are reflected by the support, social interaction, feedback, and behaviour of the social agents given to adolescents, and they could be adaptive or maladaptive to adolescents' PA level (Ames, 1995; Welk et al., 2003). In this study, we applied the Social Influence in Sport Model (SISM) to examine the relative role of parents, PE teachers and peers on the sporting experience of secondary school students' intention in leisure-time PA.

3.1.1 Social Influence in Sport Model

The SISM is derived from the Perceived Social Influence in Sport Scale-2 (PSISS-2; Chan, Keegan, et al., 2019). In the model, the social influence of significant others is conceptualised into three dimensions. The first factor of the model is a positive social influence that involves positive reinforcement (praises and rewards for good performance) and affiliation (e.g., respect, support, and understanding). Punishment (punishment/criticisms for errors and mistakes) and dysfunction (e.g., conflicts and negative emotions/behaviors that impair interpersonal relationships and harmony) are two negative factors of the model where social influences are conditional or unconditional on sports performance. These three factors have been shown to be robust dimensions of social influences that reflect how significant others apply social support/verbalisation/behaviour in the context of youth sports (Chan, Keegan, et al., 2019) and have been predictive of child and adolescent effort (as well as competence, enjoyment, and anxiety) in sports. The findings showed that children and



adolescents placed more effort in sports when their significant others (i.e., coaches, parents, and peers) exerted more positive influence and less punishment and dysfunction in the social environment. Researchers have also found that students' intention, experience, or performance in leisure-time PA may be hampered by controlling behaviors (i.e., punishment, dysfunction) from PE teachers (Koka et al., 2020; Viksi & Tilga, 2022) and parents (Liszewska et al., 2018), as well as by verbal victimization from peers (Fitzgerald et al., 2012; Salvy et al., 2012).

It is important to note that sports are a form of structured PA (Yao & Rhodes, 2015). Perhaps the findings of Chan and colleagues (2019) could be generalised to individuals' participation in PA. However, the sample of their study was young athletes (aged 9 to 18) who competed and regularly trained in sports (Chan, Keegan, et al., 2019), so the findings might not be representative of sport participants at recreational levels or young people who do not regularly engage in leisure-time PA. It is worthwhile to examine the SISM among the general population to reveal if the social influence of significant others (e.g., PE teachers, parents, and peers) is predictive to students' intention to engage in leisure-time PA.

3.1.2 Present Study

The present study examined the SISM as a framework to explain how the social influence of parents, PE teachers, and peers is predictive to secondary school students' intention to engage in leisure-time PA. We preliminarily tested this model with a two-wave prospective design such that the findings could provide more robust evidence about the temporal relationship between the social influence of significant others and leisure-time PA intention compared to previous studies of the model using cross-sectional designs (Chan, Keegan, et al., 2019; Chan et al., 2012).

Based on the findings of the SISM (Chan, Keegan, et al., 2019; Chan et al., 2012), we



hypothesised the following:

- Students' leisure-time PA intention would be positively associated with positive influence (H1), and negatively associated with punishment (H2) and dysfunction (H3).
- The relationships of H1, H2, and H3 would be consistent between social influences created by PE teachers, parents, and peers (H4).

3.2 Methods

3.2.1 Participants

The study protocol was designed to obtain quality data from a representative sample of pupils from participating schools while minimizing the burden on schools. Upon ethics approval from the Institutional Review Board of EduHK, we recruited 2,484 students (M age = 13.96, SD = .817; age range = 11 to 18 years; 2,043 students aged 11-14, 439 students aged 15-18, 2 students data were missing; female = 50%) who were able to understand the questionnaire and without any disability/disease that prevents them from participating in leisure-time PA from 7 secondary schools in Beijing, China, by distributing our survey to the network of PE teachers and school principals in the region.

3.2.2 Measures

Social Influence. The 16-item PSISS-2 was adapted for a leisure-time PA setting to measure the social influence of PE teachers, fathers, mothers and peers. The development of the PSISS-2 has undergone rigorous validation procedures. Robust psychometric properties and predictive power of this scale were reported in sports settings (Chan, Keegan, et al., 2019; Chan et al., 2012). An example item was "When I take part in leisure-time PA, my PE teachers/parents/peers make me feel good". Participants completed three ratings in terms of PE teachers, parents, and peers for each of the PSISS-2 items and responded to each item on a



5-point Likert scale with anchors ranging from "*not at all true*" (1) to "*very true*" (5) for each social agent. Participants were instructed to skip the items for the social agents that did not apply to them, and only one student chose to skip all three social agents. The Cronbach's alphas of the PSISS-2 constructs at T1 ranged between .800 and .928.

PA Intention. PA intention was measured by the three items adopted from the subscale of the PA version of the Theory of Planned Behaviour Scale (Chan et al., 2020). Intention, according to the Theory of Planned Behaviour (Ajzen, 1985), is the most proximal predictor of individual future engagement in a given behaviour. An example item was "I plan to do PA in my leisure time in the forthcoming month". Participants responded on a 7-point scale with anchors ranging from "*not at all true*" (1) to "*very true*" (7). The Cronbach's alpha of leisure-time PA intention at T2 was .943.

3.2.3 Procedure

Parents or legal guardians of the participants and the participants signed informed consent forms to ensure they understood the rights of their children's participation. Participants were asked to complete an online survey comprising measures of PSISS-2 and leisure-time PA intention at T1 (baseline) and T2 (1-month follow-up). Follow-up responses were matched using subject identifiers of the school and student ID of the participants. The retention rate at follow-up was satisfactory (96.7%).

Structural equation modelling (SEM) analysis was conducted using maximum likelihood with robust standard errors (MLR) in Mplus version 8.1 (Muthén & Muthén, 1998-2017). To test the hypotheses (H1, H2 and H3), we ran three separate models for parents, PE teachers and peers in the relationship between social influence at T1 and leisure-time PA intention at T2. To test H4, multigroup analysis was conducted to test the invariance of the predictive pathways in the three models. We used Wald tests to examine if the pathways were



consistent across parents, PE teachers, and peers. In all models, age and sex were inserted as control variables. Multiple goodness-of-fit indices (i.e., Comparative fit index (CFI), the Tucker–Lewis Index (TLI), the root mean square error of approximation (RMSEA), and the standardised root mean square residual (SRMR) were used to assess the overall fit of the proposed mediation models. Models were regarded to have acceptable goodness-of-fit if the CFI and TLI values neared or surpassed .90, with RMSEA and SRMR values less than .08 (Marsh, 2007).

3.3 Results

The zero-order correlation matrix of the study variables is available in Table 6. The models, respectively for parents ($\chi 2 = 1474.235$, df = 155, CFI = .935, TLI = .912, RMSEA = .059 [90% CI = .056 to .061], SRMR = .065), PE teachers ($\chi 2 = 1350.718$, df = 155, CFI = .940, TLI = .919, RMSEA = .056 [90% CI = .053 to .059]), SRMR = .059, and peers ($\gamma 2$ = 1346.349, *df* = 155, CFI = .949, TLI = .931, RMSEA = .056 [90% CI = .053 to .058], SRMR = .064) yielded excellent fit indices. The three models had highly consistent pathways and explained variances in the prediction of leisure-time PA intention (see Figure 5).. In particular, leisure-time PA intention ($R^2 = .103$ to .112) was positively associated with positive influence (supported H1; β = .223 to .236, p < .001), and positively associated with punishment (in contrast to H2; β =.214 to.256, p <.01) but negatively associated with dysfunction (supporting H3; $\beta = -.281$ to -.335, p < .001). In the multigroup analysis, both configural model and constrained model yielded acceptable goodness-of-fit ($\chi 2 = 4735.193$, df = 525, CFI = .934, TLI = .921, RMSEA = .057 [90% CI = .055 to .058], SRMR = .072; $\gamma 2 = 4735.193$, df = 525, CFI = .934, TLI = .921, RMSEA = .057 [90% CI = .055 to .058], SRMR = .072;) and Wald's test showed that the strengths of the relationship between perceived social influence and leisure-time PA intention were not significantly different among parents, PE teachers, and peers (see the full



standardized parameter estimates in Table 7), supporting the H4¹.

	1	2	3	4	5	6	7	8	9	10				
1.T1pi_p	.904													
2.T1pi_c	.845**	.902												
3.T1pi_pe	.761**	.808**	.928											
4.T1punish_p	243**	208**	197**	.855										
5.T1punish_c	208**	234**	208**	.914**	.855									
6.T1punish_pe	203**	211**	209**	.873**	.909**	.868								
7.T1dysfun_p	306**	270**	266**	.668**	.620**	.622**	.800							
8.T1dysfun_c	271**	294**	251**	.623**	.667**	.653**	.904**	.810						
9.T1dysfun_pe	275**	272**	284**	.616**	.639**	.705**	.878**	.926**	.831					
10.T2inten	.244**	.255**	.258**	040*	047*	-0.036	119**	137**	118**	.943				
11.T3MET	.061**	.079**	.098**	.006	.006	.007	0.026	0.023	0.026	.054*				

 Table 6 Zero-Order Correlations and Reliability of the Study Variables

Zero-Order Correlations and reliability of the Study Variables

Note. T1 = Time 1; T2 = Time 2; T3 = Time 3; $p_p = parent positive influence; <math>p_c = coach positive influence; p_p = parent punish_p = parent punish_c = coach punish_p = parent punish_n = parent dysfunction; dysfun_c = coach dysfunction; dysfun_p = parent dysfunction; dysfun_c = coach dysfunction; dysfun_p = parent dysfunction; dysfun_c = coach dysfunction; dysfun_s = parent dysfunction; dysfun_c = coach dysfunction; dysfun_s = parent dysfun_s = parent dysfun_s = parent dysfun_s = parent$

¹ ¹We conducted Wald's test to examine if there were any gender differences in the predictions of SISM. The findings showed that the relationships between perceived social influence and leisure-time PA intention were consistent between boys and girls (see the full standardized parameter estimates in Appendix D table 8).

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Figure 5 Standardised Parameter Estimates of Pathways



 Table 7 Standardised Parameter Estimates for Multi-Group Analysis of Social Agents

]	Parent		Coach	Peer			
	β	95%CI	β	95%CI	β	95%CI		
Positive influence								
\rightarrow Intention	.226***	.181, .272	.224***	.178, .271	.236***	.192, .281		
Punishment \rightarrow								
Intention	.206**	.094, .319	.257**	.135, .379	.265**	.124, .406		
Dysfunction \rightarrow								
Intention	274***	402,146	338***	474,202	331**	486,175		

Notes. Parameter estimates of the multiple-group SEM controlling for participants' age and sex. ** p < .01 *** p < .001

3.4 Discussion

This prospective study preliminarily applied the SISM (Chan, Keegan, et al., 2019; Chan et al., 2012) to explain how parents, PE teachers, and peers exert their social influences on secondary school students' intention to participate in leisure-time PA. Our findings generally supported our hypotheses regarding the predictive power of the SISM (Chan, Keegan, et al., 2019; Chan et al., 2012) on students' leisure-time PA intention, and the predictions were shown to be consistent among parents, PE teachers and peers.

3.4.1 Positive Influence



In support of H1, positive influence established a relationship with leisure-time PA intention. This pattern of results is in agreement with previous studies about how significant others may support students' commitment/intention to general sport (Lindsay et al., 2018; Martins et al., 2021) and exercise activities (Lawler et al., 2021) and the findings of SISM (Chan, Keegan, et al., 2019; Chan et al., 2012). The present finding may suggest that students are more likely to have a higher intention to take part in leisure-time PA when their significant others exert positive social influence in PA environments. According to the SISM (Chan, Keegan, et al., 2019; Chan et al., 2012), positive social influences may involve positive reinforcement (e.g., praise, encouragement, and reward for good performance) or affiliation (e.g., respect, understanding and affection) from significant others.

3.4.2 Punishment and Dysfunction

Punishment (H2) and dysfunction (H3) were hypothesised to be negative predictors of leisure-time PA intention. However, only H3 was supported by having a negative relationship between dysfunction and intention. The findings in relation to H3 were supportive of the tenet of the SISM (Chan, Keegan, et al., 2019; Chan et al., 2012) and aligned with the literature about the maladaptive roles of negative social influence (e.g., bullying and victimisation) on general PA (Fitzgerald et al., 2012; Lawler et al., 2021), swimming (O'Rourke et al., 2011) or competitive sports (Fraser-Thomas et al., 2008) of children and adolescents. Unexpectedly, the relationship between punishment and intention was positive, in contrast to H2. A previous study also reported similar research findings regarding the positive predictive effects of punishment on effort and competence in the context of competitive swimming (Chan et al., 2012). However, such findings were only exclusive to adolescent athletes and specific social agents (i.e., mother and peers). Accordingly, punishment is a conditional social influence involving penalty, criticism, or negative reaction against poor performance or mistakes in



sport, whereas dysfunction is an unconditional social influence involving conflicts and negative emotions/behaviours that would impair interpersonal relationships (Chan, Keegan, et al., 2019). The contradictory predictions of punishment and dysfunction may suggest that negative behaviours or verbalisation could be viewed as constructive criticisms as soon as individuals understand that the negative social influences from significant others serve good purposes (Chu & Zhang, 2019). When significant others react or respond to students' poor performance or mistakes in PA contexts, they should be more explicit in explaining the rationales behind their criticisms and suggest ways for improvement.

3.4.3 Parents, PE Teachers, and Peers

In support of H4, the relationships between social influences and leisure-time PA intention were consistent among parents, PE teachers and peers. Our findings might indicate that the role of these three social agents in students' intention to engage in leisure-time PA could be equally vital, in line with previous studies (Anderssen & Wold, 1992; McDavid et al., 2012; Zhou et al., 2019). Thus, parents, PE teachers and peers may be seen as important social agents and important sources of social influences of leisure-time PA in adolescents. However, this pattern of findings appeared to be incongruent with previous studies that suggested parents or PE teachers were more important than peers (Carr et al., 1999; Papaioannou et al., 2008). Indeed, the inconsistent findings might be due to differences in the applications of theoretical frameworks of social influences or the variations in the assessments of sport-related outcomes (e.g., competence, enjoyment, and anxiety) (Chan, Keegan, et al., 2019; Chu & Zhang, 2019). In addition, our current study focused on PA among secondary school students' leisure-time PA instead of elite sports among young athletes (Chan, Keegan, et al., 2019; Chan et al., 2012), so the differences in participants' demographic backgrounds and the nature of the behavioural contexts could also explain the unique findings of our study.



It is recognised that sport is a form of structured PA (Yao & Rhodes, 2015). Future studies should formally compare the predictive power of the SISM on PA outcomes between sport participants at different sport levels and age groups.

3.4.4 Limitations and Future Directions

Despite the strengths of the sample size, the prospective design, and the unique theoretical and practical implications of our study, we have to point out a few of our study limitations that may be important to address in future studies. First, a prospective design with correlational analysis precluded our findings to draw any causal inference. Second, the exclusive use of self-reported scales for measuring intention and other study variables could lead to issues of social desirability and consistency tendency, which could confound the response patterns (Chan et al., 2020). Third, we only examined the social influences from parents, PE teachers and peers, so our findings cannot be generalised to other significant social agents (e.g., siblings, grandparents, and sports stars) who might also be important to students' leisure-time PA. Finally, we only collected data from Beijing, China, and measured age and gender as covariate variables. Other variables, such as socioeconomic factors, accessibility of sports facilities, and environmental factors, were not taken into consideration. Future studies may address these limitations by improving the study design (e.g., randomised controlled intervention) and measurement (i.e., objective measures of PA level, including the use of accelerometer). Finally, we encourage further studies to take more consideration of social and environmental factors related to leisure-time PA participation and include broader coverage of social agents and multi-cultural samples (Chan, Yang, et al., 2015) so that the evidence of SISM could be examined and generalised to children and adolescents with diverse backgrounds (Chan, Keegan, et al., 2019; Chan et al., 2012).



3.5 Conclusion

Our prospective study provided initial evidence and answered that the social influences of parents, PE teachers, and peers were equally important to students' intention to take part in leisure-time PA based on the SISM framework. Students reported higher leisure-time PA intention when the social influence of these significant others was high in positive influence and punishment and low in dysfunction. To promote students' engagement in leisure-time PA, significant others are recommended to be more cautious about the valence and conditionality of social influence. Significant others' behaviours and verbalisation on promoting PA are recommended to be more positive (i.e., praise, rewards, encouragement, understanding); otherwise, they should consider providing more explicit rationales behind negative feedback. In this case, students are more likely to interpret negative responses as constructive criticisms that might be helpful to their participation in leisure-time PA.



Chapter 4: Significant Others and Children's Mental Toughness in Sports: A Longitudinal Test of the Social Influence in Sport Model

This chapter is a modified form of the following article being under review:

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Summary of Chapter 4

Mental toughness (MT) is an important psychological quality. This two-wave longitudinal study examined if the social influences of coaches, fathers, mothers and peers were predictive of children's mental toughness in sport contexts. The participants were 112 children (7 to 12 years old) who played basketball at the recreational level in China. At baseline and at the 3-month follow-up, they completed a questionnaire measuring their mental toughness and perception of social influences, such as positive influence, punishment, and dysfunction, from the four social agents. The model with correlations between social influence and mental toughness at a change-score level yielded excellent goodness-of-fit using variance-based structural equation modeling (VB-SEM). Children's mental toughness $(R^2 = .37 \text{ to } 45)$ was positively associated with positive influence ($\beta = .228 \text{ to } 361, p < .01$), and negatively associated with dysfunction ($\beta = -.166$ to -.367, p < .05). Δ Punishment was predicted negatively by Δ social influences from coaches, fathers, and mothers ($\beta = -.182$ to -.247, p < .05), but not $\Delta peers$ ($\beta = .049$, p > .05). Multi-group SEM showed that the relationships were invariant between coaches, fathers, mothers and peers. The findings show that children are more likely to have increased mental toughness when significant others exert positive social influence in the sporting environment.



4.1 Introduction

Mental toughness is an important psychological quality, both in sports (Liew et al., 2019; Weinberg & Gould, 2003) and other life domains (Connaughton et al., 2008; Mallett & Coulter, 2012). In the literature of sport and exercise psychology, mental toughness refers to a multidimensional concept of being psychologically more resilient against prolonged exposure to pressure, external demands, or difficulties, and it is characterized by having higher selfmotivation or commitment, unshakeable beliefs, and adaptive coping in the face of continuous challenges (Clough et al., 2002; Crust & Clough, 2011; Gucciardi et al., 2012). Mental toughness is always regarded as the most important psychological attribute in dealing with obstacles (Bell et al., 2013), managing the potential of negative emotions (Aryanto & Larasati, 2020), determining successful performance (Gould et al., 2002) and accomplished tasks (Aryanto & Larasati, 2020) in sports and PA settings. Mentally tough individuals are typically more psychologically resilient and durable, and are more likely to maintain wellness and optimal functioning against challenges and drawbacks (Crust, 2008; Gucciardi et al., 2012). In addition, according to Sheard et al. (2009), mental toughness is associated with confidence, constancy, and control under pressure or from intensive competition. In sport and exercise psychology, the literature appears to support the view that the social environment plays an important role in facilitating mental toughness (e.g. Connaughton et al., 2008; Weinberg et al., 2011). However, there is no consensus as to what types of social influence, such as social support, dysfunction, or punishment, are adaptive to the development of mental toughness in sports. There is also no consensus as to which social agents, such as coaches, parents, or peers, are more important in this regard (Connaughton et al., 2008; Gucciardi et al., 2009; Thelwell et al., 2010). To address this knowledge gap, our current study aims to examine whether the social influences of coaches, parents, and peers are predictive of children's mental toughness in sports.



4.1.1 Significant Others' Role in Children's Mental Toughness in Sport

Coaches, parents, and peers are often regarded as significant sources of social influences that may develop the mental toughness of children (Butt et al., 2010; Connaughton et al., 2011). However, both positive and negative types of social influence have been shown to be adaptive to children's mental toughness. For instance, previous studies have reported that positive types of social influence such as encouragement (Butt et al., 2010), social support (Butt et al., 2010; Connaughton et al., 2008), autonomy (Mahoney et al., 2014), and supportive behavior (Rodahl et al., 2015) from coaches, parents, and peers may facilitate young athletes' mental toughness. However, there is evidence that *negative* social influence, such as punishment, criticism, or aggravation, from coaches, parents, and peers can aid in the development of athletes' mental toughness (Bell et al., 2013; Coulter et al., 2010; Nicholls et al., 2016). However, this in itself is contradicted by empirical studies showing that punishment or control from coaches is negatively associated with young athletes' mental toughness (Gucciardi et al., 2017). The conflicting findings might be attributed to the use of different measurements and theories, individuals' backgrounds (e.g., age, PA type), as well as the nature of the behavioral contexts (e.g., recreational PA, professional PA), which could explain why mental toughness has a different relationship with negative social influences.

In summary, a number of empirical studies have documented the role of coaches, parents, and peers on children's mental toughness. However, the findings are mixed and do not allow a formal comparison of what types of social influences and which social agents are more important in fostering children's mental toughness. It is important to address this research gap by examining whether various forms of social influence are predictive of children's mental toughness in sports, and whether the predictive values are comparable across multiple social agents.



4.1.2 Social Influence in Sport Model (SISM)

To comprehensively standardize the evaluation of social influences in the sporting environment of children, our study applied the Social Influence in Sport Model (SISM; Chan, Keegan, et al., 2019) to conceptualize the social influences of coaches, fathers, mothers, and peers. We examined how the influence of these social agents relates to children's mental toughness in sport settings. According to SISM, significant others in sports may exert three types of social influences: positive influence, punishment, and dysfunction. Positive influence is made up of two factors:

- conditional positive reinforcement for good performance, such as encouragement, rewards, praises, and positive emotion
- unconditional affiliation that may cultivate a harmonious social relationship, such as respect, affection, supportiveness, and understanding.

Punishment is a conditional negative social influence that significant others exert when children make mistakes or perform poorly. Such negative influences include criticism, disappointment, and negative reactions. Dysfunction is an unconditional negative social influence, such as conflicts, emotions, lack of respect, and negative behavior. It is believed to be harmful to interpersonal relationships and may cause social disharmony (Chan, Keegan, et al., 2019; Langan et al., 2013; Weiss et al., 1996).

Previous studies that applied the SISM have found that children are more likely to experience more favorable behavioral patterns such as effort, competence, enjoyment, and reduced anxiety both in sport (Chan, Keegan, et al., 2019; Chan et al., 2012) and other settings (e.g., physical education, and learning; Chan, Lo, et al., 2019) when significant others exert a positive influence, rather than punishment and dysfunction. Furthermore, while parents have a direct influence on their children's PA experience and level in recreational and leisure-time settings, coaches and PE teachers still continue to play important roles. In line



with the findings that all social agents (i.e., coaches, fathers, mothers and peers) has consistent predictive power with motivational outcomes (Chan, Keegan, et al., 2019), a previous study also states that coaches' and PE teachers' influence on physical education will have an impact on students' perceived intents and PA behavior outside of class (Hagger et al., 2003). These findings have led us to speculate that the three dimensions of SISM could be predictive of children's mental toughness in sports settings, with the equally important influence among each social agent.

4.1.3 Present Study

The present study was a two-wave longitudinal study that applied the SISM to explain the relationships between the social influence of coaches, fathers, mothers, and peers and children's mental toughness in sports. Based on previous findings (Ames, 1995; Butt et al., 2010; Connaughton et al., 2008; Nicholls, 1989; Thelwell et al., 2010) and findings of Social Influence in Sport Model (Chan, Keegan, et al., 2019; Chan et al., 2012), we hypothesised the following:

• Children's mental toughness in sports is predicted positively by positive influence (H1) and negatively by punishment (H2) and dysfunction (H3). We hypothesize that these predictions would hold after controlling for children's age, sex, length of sports, and sports performance.

• The relationships between social influences and mental toughness illustrated in H1, H2 and H3 would be consistent between social influences created by coaches, fathers, mothers, and peers (H4).

4.2 Methods

4.2.1 Participants



We distributed our survey to a network of basketball coaches and primary school principals in Chengdu, China, and recruited 112 children (M age = 10.12, SD = 1.33; age range = 7 to 12 years; male = 86%) from 3 primary schools and 2 training institutions. Participants took part in regular basketball training provided within the school or basketball training clubs 1-2 times a week, with each session lasting for 60-90 minutes.

Participants were recreational level players who had at least 6 months of training experience in basketball (mean years of experience = 2.50, SD = 1.49) and had been training with their basketball coaches for 1.78 years (SD = 1.47).

4.2.2 Measures

Social Influence: The 16-item Chinese version of PSISS-2 was adopted to measure the social influence of coaches, fathers, mothers, and peers. The development of PSISS-2 passed through rigorous validation procedures. The robust psychometric properties and predictive power of this scale were reported in sports settings (Chan, Keegan, et al., 2019; Chan et al., 2012). An example item is "When I take part in PA, my coaches/fathers/mothers/peers make me feel good". Participants responded to each item on a 5-point Likert scale with anchors ranging from "*not at all true*" (1) to "*very true*" (5) for each social agent. The Cronbach's alphas of the PSISS-2 constructs ranged between .600 and .934.

Mental Toughness: Metal toughness was measured by 14 items of the Sports Mental Toughness Questionnaire (SMTQ) (Sheard et al., 2009) in Chinese. Confidence, constancy, and control were identified by the SMTQ, providing a comprehensive and meaningful understanding of mental toughness. An example item is "I am committed to completing the tasks I have to do". Participants responded on a 4-point scale with anchors ranging from "*not at all true*" (1) to "*very true*" (7). The Cronbach's alphas of mental toughness ranged between .646 and .887.



Sports Performance: To statistically control for the confounding effects of sports performance, PE teachers and coaches evaluated the basketball performance of participants by various basketball tasks, including right-hand layups, left-hand layups, and free throws. Participants were asked to perform each task 10 times. The overall accuracy score was indicated by the average number of successful shots out of 10.

Demographic measures: Information on demographic variables, such as age, sex, and length of basketball practice, was collected alongside other measures in the survey at T1.

4.2.3 Procedure

Upon ethics approval from the Human Research Ethics Committee of [institution blinded from masked review] and consent given by parents or legal guardians of the participants, participants completed surveys of social influences and mental toughness at T1 (baseline) and T2 (3-month follow-up). The response rate at T2 (89.29%) was satisfactory.

To test if the changes in the social influence dimensions were associated with changes in mental toughness, we first calculated the extent of change between the two time points (i.e., T1 and T2) indicated by the standardized residual change score (Δ). This score was produced by regressing each variable measured in Time 2 on the corresponding variable in Time 1 (Goode et al., 1998). Second, the suggested model was tested using Warp PLS v8.0 software and variance-based structural equation modeling (VB-SEM), commonly known as partial least squares analysis. As this is based on ranked rather than ordinal data, VB-SEM is distribution-free and less affected by nonnormality, model complexity, and lower sample sizes (Henseler, 2010). To test the hypotheses (H1, H2, and H3), we ran four separate models for coaches, fathers, mothers, and peers in the relationship between Δ social influence and Δ mental toughness. To test H4, multigroup analyses were conducted to test the invariance of the predictive pathways in the four models by pairs of groups. The multigroup analysis was



tested by the constrained latent growth method (Williams et al., 2009). In all models, age, sex, sports year, and PA performance were inserted as covariates in the prediction of mental toughness.

Multiple criteria were used to evaluate the overall model fit: the goodness-of-fit (GoF) index, which had values of .100, .250, and .360, corresponding to small, medium, and large effect sizes, respectively (Tenenhaus et al., 2005). The average variance inflation factor (AVIF) value and average full collinearity VIF (AFVIF) for model parameters should be less than 5.000. The average R² (ARS), average path coefficient (APC), and average adjusted R-squared (AARS) should be significantly different from zero for an adequate model (Kock, 2021). A value of 0.7 or higher is required for Simpson's paradox ratio (SPR), statistical suppression ratio (SSR), and nonlinear bivariate causality direction ratio (NLBCDR). The R-squared contribution ratio (RSCR) must be greater than or equal to 0.9 (Kock, 2021). In addition, we also tested the discriminant validity and score reliability of the latent factors. For discriminant validity, we tested if the square root of the average variance extracted (AVE) values is more than 0.50 and surpasses its correlation with the other latent variables (Fornell & Larcker, 1981). Acceptable score reliability could be revealed by having composite reliability values larger than .70 (Kock & Lynn, 2012) and Cronbach's alphas over .60 (Ursachi et al., 2015).

4.3 Results

The zero-order correlation matrix of the standardized residual change score of the study variables is displayed in Table 3. The models for coaches, fathers, mothers, and peers yielded excellent fit indices, with APC ranging from .145 to .165, ARS ranging from .372 to .446, AARS ranging from .324 to .404, AVIF ranging from 1.1223 to 1.446, AFVIF ranging from 1.372 to 1.443, GoF ranging from .543 to .594, SPR ranging from .714 to .857, RSCR



ranging from .920 to .998, SSR and NLBCDR reaching 1.000, composite reliability ranging from .804 to .926. The four models had highly consistent pathways and explained variances in the prediction of mental toughness (see Figure 6). In support of H1 and H3, Δ mental toughness (R² = .37 to 45) was positively associated with Δ positive influence (β = .228 to 361, p < .01), and negatively associated with Δ dysfunction (β = - .166 to - .367, p < .05). Δ Punishment was predicted negatively by Δ social influences from coaches, fathers, and mothers (β = - .182 to - .247, p < .05), but not Δ peers (β = .049, p > .05). As such, H2 was partially supported. In support of H4, multi-group analysis showed that the strengths of the relationship between Δ perceived social influence and Δ mental toughness were not significantly different between coaches, fathers, mothers, and peers, with p values ranging from 0.176 to 0.487 (see the full p values in Table 4).



	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Дрі_c														
2. Δpi_f	.433**													
3. Δpi_m	.506**	.849**												
4. Δpi_p	.339**	.637**	.731**											
5. Δpu_c	043	200	209*	237*										
6. Δpu_f	075	101	129	163	.882**									
7. ∆pu_m	.025	035	134	096	.820**	.901**								
8. ∆pu_p	.031	107	092	233*	.789**	.719**	.702**							
9. ∆dy_c	- .210*	469**	495**	333**	.587**	.574**	.610**	.465**						
10. ∆dy_f	093	194	206*	197	.502**	.636**	.561**	.381**	.731**					
11. Δdy_m	209*	394**	390**	337**	.459**	.524**	.584**	.461**	.777**	.756**				
12. ∆dy_p	033	314**	406**	444**	.511**	.592**	.567**	.595**	.767**	.740**	.738**			
13. $\Delta conf$.257*	.461**	.423**	.416**	187	167	056	195	399**	274**	375**	321**		
14. $\Delta cons$.192	.308**	.377**	.376**	398**	451**	405**	325**	618**	522**	613**	607**	.543**	
15. Δcont	.253*	.255*	.392**	.450**	418**	435**	349**	265**	518**	483**	507**	500**	.429**	.580**

Table 9 Zero-Order Correlations of the Residual Change Scores of Study Variables

Notes. pi= *positive influence; pu*=*punishment; dy*=*dysfunction; c*=*coach; f*=*father; m*=*mother; p*=*peer; conf*=*confidence; cons*=*constancy; cont*=*control*

* *p* < .05 ** *p* < .01



Figure 6 Standardised Parameter Estimates of Pathways



Table 10 Standardized Parameter Estimates of Multi-Group SEM

	Coach vs. Father			Coach vs. Mother			Coach vs. Peer			Father vs. Mother			Father vs. Peer			Mother vs. Peer		
	β_{coach}	eta_{father}	р	β_{coach}	β_{mother}	р	β_{coach}	β_{peer}	р	eta_{father}	β_{mother}	р	eta_{father}	Bpeer	р	β_{mother}	β_{peer}	р
$\mathrm{PI} \rightarrow \mathrm{MT}$.228 **	.329 ***	.380	.228* *	.27**	.228	.228 **	.361 ***	.402	.329** *	.27**	.330	.329* **	.27**	.468	.27**	.361* **	.287
PU → MT	205 *	247* *	.398	205 *	182 *	.263	205 *	049	.255	- 0.247* *	182 *	.184	247* *	182 *	.178	182 *	049	.487
DY→ MT	322 ***	166*	.453	322 ***	367 ***	.263	322 ***	353 ***	.300	166*	367 ***	.176	166*	367 ***	.261	367 ***	353 ***	.403

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Parameter estimates of the multiple-group SEM controlling for participant's age, sex, length of sports and PA performance. ** p < .01 *** p < .001



4.4 Discussion

The current study applied SISM (Chan, Keegan, et al., 2019; Chan et al., 2012) to explain how coaches, fathers, mothers, and peers predicted children's mental toughness in sports. Overall, the results generally support the robustness of SISM in explaining how perceived social influences are linked to children's mental toughness in sports.

4.4.1 Positive Influence

In accordance with the SISM, our results supported H1: a positive relationship with children's sports mental toughness. Our findings indicate that when significant others exert more positive reinforcement and affiliation, children are more likely to have higher mental toughness over time.

As with previous studies (Butt et al., 2010; Connaughton et al., 2008; Cowden et al., 2020; Smith, 2006), our findings show that positive and supportive environments created by significant others positively correlate with the development of mental toughness. It can be inferred that some essential elements of mental toughness, such as self-belief and confidence, could be promoted in positive learning environments for children (Bull et al., 2005; Butt et al., 2010). Thus, the findings may demonstrate that positive reinforcement and affiliation are important in shaping children's mental toughness.

4.4.2 Dysfunction and Punishment

Punishment (H2) and dysfunction (H3) were hypothesized to be negative predictors of children's mental toughness. Our findings suggest that children's mental toughness may decline when social agents criticize, penalize, generate conflict, or treat them disrespectfully.



These observations are contradictory to the literature's general view that challenges, pressure, and punishment-oriented behaviors are important to maintain and develop mental toughness (Beattie et al., 2019; Bell et al., 2013). Indeed, our findings support the tenet of the SISS model and are in line with the maladaptive roles of negative social influences on children's behavioral patterns in sports, such as coaches' negative evaluations (Butt et al., 2010; Weinberg, 2008), negative behavior (Gucciardi et al., 2009), and peers' bullying and victimization (Fraser-Thomas et al., 2008; Lawler et al., 2022).

However, the use of punishment may have unfavorable effects on children's sporting experience. These experiences, as shown in previous studies regarding the effects of punishment, may include decreased self-efficacy and increased anxiety (Albrecht, 2009), decreased intrinsic motivation (Vallerand et al., 1986), and, in severe cases, learned helplessness among children (Maier & Seligman, 1976). Although young athletes may perceive criticism as constructive feedback (Nicholls et al., 2016), this positive mindset might only exist in those who have a stronger mentality or are cognitively mature. Our study may provide a different view, as our sample consists of children who play basketball at a recreational level rather than professional athletes. As such, the background of participants and the nature of the behavioral settings may explain why mental toughness has a different relationship with negative social influences.

4.4.3 Coaches, Parents, and Peers

In support of H4, our findings show that the social influences from coaches, parents, and peers were consistently predictive of children's mental toughness. Our findings indicate that the role of these four social agents in children's mental toughness could be equally vital. Children may acquire mental toughness in sports in a variety of contexts created by various social agents (Thelwell et al., 2005). The literature on social influences in sports focuses more



on the role of parents and coaches in children's sports experience and psychosocial outcomes compared to that of peers or teammates (Brustad et al., 2001; Jowett & Poczwardowski, 2007). Interventions that target optimal social environments for children in sports primarily rely on coaches or parents as the medium or social agents of the interventions (e.g., Allen, 2003; Cowden et al., 2020; Gucciardi et al., 2009). Indeed, the inconsistency of our present findings with those of the literature might be due to differences in the assessment of social influences and the nature of sporting contexts to investigate the relationships between social influences and mental toughness.

Our findings provide an alternative view of the literature that peers/teammates (i.e., providing support, giving confidence) should be taken into consideration when researchers evaluate the social environment to optimize children's sporting experience (Chan, Keegan, et al., 2019; Chu & Zhang, 2019), and this is consistent with the findings that parents, coaches, and athletes have been reported as the primary sources of influence for mental toughness development (Connaughton et al., 2011).

4.4.4 Limitation and Future Directions

First, the current study primarily focused on the social influence on children's sports or PA, and research has shown that the mental toughness of children is linked to how they perceive the behaviors of significant others (Nicholls et al., 2016) and the cognitive/affective patterns of social agents (Dorsch et al., 2009). Thus, the child-to-social agent dynamic is a vital area for future study (Partridge, 2011).

Second, the two-wave longitudinal design of our study only offers evidence about how changes in social influence are associated with changes in children's mental toughness. Our correlational analysis offers limited evidence on the direction of relationships between social



influence and mental toughness. Similarly, the causal relationships between social influence and mental toughness remain unknown. Future research should adopt factorial designs that manipulate the social influences of significant others in sports. However, such a study design is extremely challenging, as it involves multiple social agents who are important to children to varying degrees.

Third, the use of self-report questionnaires and the reliance on child-report data may raise concerns about the plausible confounding effects of response bias due to the social desirability for mental toughness (Crust et al., 2011) and common method variance (Chan, Ivarsson, et al., 2015; Chan et al., 2020). Future studies should explore alternative assessment methods of mental toughness and include other-report measures of social influences.

4.5 Conclusion

Our study is the first application of the Social Influence in Sport Model (Chan, Keegan, et al., 2019; Chan et al., 2012) in the context of sports mental toughness. In general, the findings support the tenets of the model and answer the research question that the social influences of coaches, fathers, mothers, and peers are equally important to children's mental toughness. Children reported higher mental toughness when the social influence of these significant others was high in positive influence and low in punishment and dysfunction. To promote children's mental toughness, significant others' behaviors and verbalisation should be *positive* (i.e. praise, rewards, encouragement, understanding).



Chapter 5: General Discussion

5.1 Overview of Thesis

In general, using the 2x2 conceptualisation described in the SISM (Chan, Keegan, et al., 2019), the three studies in my thesis aimed to gain a better understanding of how significant others and social influence types may impact motivational and behavioural outcomes, as well as health development in the context of leisure-time PA settings or recreational PA settings. Study 1 offered a meta-analysis that summarised the findings to answer (a) the magnitude of the overall association between different types and sources of social influence and PA level and (b) whether the relationship between social influence and PA holds stable across child age group, child gender, parental gender, respondent of parental influence, and the type of PA measurement. Our findings showed that 1) positive parental influence was positively and significantly associated with the PA level of children and adolescents. 2) The two negative parental influences (punishment and discouragement) were not significantly related to the PA level of children and adolescents. 3) The association between positive parental influence and PA level was significantly moderated by parental gender, respondent of parental influence measure, and type of PA measure. Specifically, parental gender significantly moderates the relationship between positive parental influence and PA level but is not different between mothers and fathers. Similarly, there is no significant difference when measuring PA objectively versus subjectively in the relationship between positive parental influence and PA. Meanwhile, positive parental influence is more significantly correlated with PA level when the evaluation is parent-reported than when it is child-reported.

Study 2 looked at leisure-time PA and examines the role of parents, teachers, and classmates on students' intention in this situation and provided initial evidence about the use of the SISM (Chan, Keegan, et al., 2019; Chan et al., 2012) through a prospective perspective. The findings generally validated the tenets of the model and suggested that peer, parent, and



PE teacher influence all had a significant role in students' intentions to engage in leisure-time PAs. Leisure-time PA intention was positively associated with positive influence and punishment but negatively associated with dysfunction.

Study 3 aimed to examine how social influence from significant others in basketball sports is predictive of children's mental toughness by applying the SISM at the recreational PA level with two-wave longitudinal data. Our findings indicated that the social influences of coaches, fathers, mothers, and peers were equally important to children's mental toughness. Children reported higher mental toughness when the social influence of these significant others was high in positive influence and low in punishment and dysfunction.

In sum, although the meta-analysis did not find any significant associations between negative parental influence and PA level, our results comprehensively highlighted that children and adolescents can benefit from the positive influence of various social agents, including parents, PE teachers, coaches, and peers, in multiple aspects. The intentions and mental toughness of children and adolescents were equally influenced by parents, coaches/PE teachers and peers/classmates.

5.2 Positive Influence

Given that previous research has consistently demonstrated that parental support is a good predictor of children and adolescent PA (Khan et al., 2020; Lawler et al., 2022), it is not surprising that positive influence was confirmed by the three studies to have a good impact on children and adolescents' psychological well-being and behaviours. Children and adolescents experience increased enjoyment, self-efficacy, motivation (Laird et al., 2018), and commitment (Robbins et al., 2017) with more positive influence. The complexity of the relationship between social influence and PA-related outcomes, with its numerous providers of influence (i.e., parents, coaches, peers), PA types (i.e., leisure-time PA, recreational PA, elite sports) measurements (i.e., objective vs. subjective), assessment of social influence (i.e.,



child-reported vs. parent-reported), and varying children characters (i.e., age, gender), however, should be taken into consideration and carefully explained.

5.3 Punishment and Dysfunction

The results regarding negative social influence are inconsistent. Our findings for punishment indicated a positive association with intention but a negative correlation with mental toughness. One of the explanations for this discrepancy is that Study 2 examined adolescents, whereas Study 3 concentrated on children; that is, adolescents with a stronger mentality or who are cognitively developed may perceive criticism as constructive feedback (Nicholls et al., 2016), leading to positive results. A further factor is that different PA types may have varying effects on the attitudes of social agents. Though we did not investigate whether PA types could be a confounding factor influencing the relationships between social influence and psychological outcomes, previous research revealed that playing an individual sport produces more parental stress than participation in team sports since performance is more reliant on individual achievement than collective performance (Bengoechea & Strean, 2007).

5.4 Parents, Coaches/PE Teachers and Teammates/Peers

Our findings indicated that parents, PE teachers and peers are seen as equally important social agents and important sources of social influences in leisure-time and recreational PA contexts in children and adolescents. Although parents directly affect their children's PA experience and level, coaches and PE teachers still play important roles in recreational and free-time PA settings. A previous study states that coaches' and PE teachers' influence on physical education will have an impact on students' perceived intents and PA behavior outside of class (Hagger et al., 2003). Our findings also provide an alternative view of the literature that peers/teammates should be taken into consideration when researchers



evaluate the social environment to optimise children's sporting experience (Chan, Keegan, et al., 2019; Chu & Zhang, 2019).

5.5 Contributions of the Thesis

5.5.1 Theoretical and Methodological Contribution

The present thesis made several contributions to our understanding of the social influence of significant others and children's and adolescents' PA participation in a number of ways. First, by applying the model to leisure-time PA and recreational PA settings among a sample of children and adolescents, as well as by examining the correlations between social influence and intentional and healthy outcomes, the results largely support the robustness and tenets of SISM. Meanwhile, previous studies may not have explored the relative importance of significant others or did not comprehensively examine comparable aspects of social influences, however, by using SISM, this conceptual model provides an opportunity to compare the roles of different social agents of their social influences in leisure-time PA and recreational PA settings. The strengths of this study also include taking negative social influence, i.e., punishment and discouragement, into consideration and giving comprehensive reviews and analysis. This is the first meta-analysis in the literature that examines both positive and negative parental influences and their associations with the PA level of children and adolescents. Study 1 may serve as a starting point for understanding how parents and their influence types may optimise or impair PA behaviors.

The thesis also brought advanced the level of evidence for the SISM in the explanation of children participation in sports and PA. Study 2 and Study 3 applied longitudinal and prospective research designs to test the SISM in the prediction of children's sport experience, which filled the research gap of previous cross-sectional studies of the SISM. This also opens up important interventions regarding the effectiveness of social influence to promote


children's PA performance and experience. Second, the large sample of Study 2 provides quality and representative data (i.e., balanced ratio of genders) for the statistical power of the analysis. Third, our mixed methods may offer a methodological synergy that guides a comprehensive understanding and validation of SISM and significant others' roles in sport science and practice.

5.5.2 Practical Contributions

The findings of the current thesis are meaningful to sports-related practitioners, families and teammates. First, within the context of SISM, our findings highlighted the value and necessity of positive social influence for children and adolescents. Therefore, social agents' behaviours and verbalisation on promoting PA are recommended to be more positive. Meanwhile, they should consider providing more explicit rationales behind negative feedback. As long as students accept negative responses as constructive criticisms, this might be helpful to their participation and psychological health in leisure-time and recreational PA contexts. These behaviour strategies derived from the tenets of SISM could potentially be applied to future PA promotion programmes or intervention for young children.

5.6 Limitations and Future Directions

Several restrictions should be kept in mind when interpreting the study's conclusions. First, the various PA kinds were not differentiated in our investigation. For instance, social support has a stronger correlation with children's and adolescents' engagement in organised PA than non-organised PA (Heitzler et al., 2006). Different PA types may also have varying effects on the attitudes of significant others (Bengoechea & Strean, 2007). Thus, this may limit further implications for social agents. Future studies may compare the impact of social



influence in different sports types. Second, a prospective or longitudinal design with correlational analysis prevented us from inferring any causative or temporal implications from the results. For instance, it is still unclear whether social influence predicts children and adolescents' PA level or the opposite. Previous studies have noted that a decline in children's PA level prompts parental control behaviours and that physically active individuals may elicit higher levels of parental support (Beets et al., 2006; Wilson et al., 2010). Future dyadic research could adapt meta-rated measures to detect the predictive relationship. Third, our empirical research adopted child-report measurements, which may raise concerns regarding the potential confounding effects of response bias due to the social desirability for responses (Crust et al., 2011) and common method variance (Chan, Ivarsson, et al., 2015; Chan et al., 2020). Future studies may explore alternative assessment methods of mental toughness and include other-report measures of social influences. Fourth, we only examined the social influences from parents, PE teachers and peers, so our findings cannot be generalised to other significant social agents (e.g., siblings, grandparents, and sports stars) who might also be important to students' leisure-time PA. Additionally, we only collected data from China, and measured age, gender, sports year as covariate variables. Other variables such as socioeconomic factors, accessibility of sports facilities, and environmental factors, were not taken into consideration. Future studies may address these limitations by improving the study design (e.g., randomised controlled intervention) and measurement (i.e., objective measures of PA level, including the use of accelerometer). We also encourage further studies to take more consideration of social and environmental factors related to leisure-time PA intention amd mental toughness, and include broader coverage of social agents (i.e., sibling, grandparents) and multi-cultural samples (i.e., collectivism vs. individualism) so that the evidence of the SISM could be examined and generalised to children and adolescents with diverse backgrounds. Last, intergenerational relationships (i.e., father-son and mother-



daughter relationships) were not included in the current study. Specifically, a previous study found that mothers' physically active behavior was positively correlated with their daughters' physical activity, while paternal role modeling was linked to higher PA levels of their sons (Schoeppe et al., 2016). Future research may go further and explain the link between social influence and PA engagement in terms of intergenerational interactions.

5.7 Overall Conclusion

In summary, the series of studies emphasize the importance of social agents influences towards children's sports experience and psychological outcomes over time by employing SISM in an integrated understanding perspective. In order to further develop and complete SISM, future research may extend to obtain evidence for the scale's concurrent and discriminant validity by analyzing the association between PSISS2's components and social influences conceptualized in other theories, such as motivational climates from achievement goal theory. Furthermore, because the current study only looked at the Chinese version of PSISS2 in a Chinese population, we were unable to account for the impact of cultural variations in language, literacy, interpretation, and response bias. As a result, future studies should focus on developing integrated strategy to cross-validating PSISS2 across varied linguistic and cultural groups.

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Appendix A

Search String

The following search string was searched in PsycInfo, Web of Science, PubMed, ProQuest and SPORTDiscus without a year limit, and only filters of English were used.

"physical* activit*" OR "exercise" OR "sport" OR "movement*" OR "fitness" OR "moderate to vigorous PA" [AND] "father" OR "mother" OR "parent*" OR "paternal" OR "maternal" [OR] "reinforcement" OR "affiliation" OR "punishment" OR "dysfunction" OR "parent* encouragement" OR "social support" OR "social influence" OR "role of significant others" OR "determinants" [OR] "parental support" OR "parental role" OR "parent* influence*" OR "perceived support from parent" OR "parent's reports of direct support" OR "parental promot*" OR "parental correlates" [OR] "support from family" OR "family support" OR "family social support" OR "activity-related support" OR "parental restriction" OR "parental perceptions" [AND] "child*" OR "adolescen*" OR "youth" OR "student*" OR "young" OR "school-age" OR "teenage*" OR "preadolescent" OR "disabilit*".



Appendix B Parental Influence Definitions and Example

Positive parental	Definitions	Example			
influence		-			
Encouragement	Parents' language or behavior to enhance the motivation of children's physical activity participation or to keep fit (DiNallo et al., 2007).	"How much does your mother/guardian encourage you to be physically active?"(DiNallo et al., 2007)			
Role modeling	Parents' high level of PA serving as an example for children and adolescents to be physically active (Van Kann et al., 2016).	"How often does your child see you being physically active?"(Van Kann et al., 2016)			
General social support	Containing multiple types of support, including tangible support (Qurban et al., 2019; Wing et al., 2016), intangible support (Qurban et al., 2019; Wing et al., 2016), logistic support (Van Kann et al., 2016) etc.	"How often do you discuss benefits being physically active?"(Qurban et al., 2019)			
Appropriateness	A view or belief perceived by children and adolescents, to which extent significant others think PA support was appropriate (Brown et al., 1989).	"How do you think the following people feel about the appropriateness of competitive sport participation for adolescent females in general? "(Brown et al., 1989)			
Help	The frequency of perceived direct parental help towards organizing exercises (Anderssen & Wold, 1992).	"Direct help in exercising hard was assessed by asking about frequency of help from parents in organizing exercise sessions of physical activities." (Anderssen & Wold, 1992)			
Value	A belief hold by children and adolescents about how valuable or important their parents thought to be physically active or fit (Anderssen & Wold, 1992).	The value of physical activity of significant others was covered through questions regarding the importance parents and friends place on being			

Table 1 Positive Parental Influence Definitions and Example of Questionnaire Items



Play with	It is about co-participation and and participating in physical activities together. Parents	physically fit and the importance friends place on being a good athlete." (Anderssen & Wold, 1992) "How many days in the past week did you do a physical activity with either of your
	might choose to participate in sports with their children or share PA with them in order to raise their children's PA levels (Rosenkranz & Dzewaltowski, 2011).	parents?"(Price et al., 2008)
Transportation	Picking up children when they need to go to physical education classes or sports activities or parents facilitated their children with transportation to participate in sports, especially those held outside school (Hoefer et al., 2001).	"How much does your mother/father provided transportation to be active for you? "(Wilk et al., 2018)
Emotional support	It is referring to emotional aid, encouragement, stimulation of participation and praise (Huffman et al., 2018; Sabiston & Crocker, 2008; Vilhjalmsson & Thorlindsson, 1998).	"How often does your parent or guardian encourage you to participate in regular physical activity?"(Sabiston & Crocker, 2008)
Monitoring/watch	Supervising child's exercise to ensure the quality, amount or safety of training (Arredondo et al., 2006).	"How much do you keep track of the amount of physical activity/active play/sport your child is getting?"(Arredondo et al., 2006; Loprinzi et al., 2013)
Reinforcement	Also known as praise, it is referred to recognition of child's performances and efforts (Arredondo et al., 2006).	"How often do you praise your child for being physically active? "(Arredondo et al., 2006)
Allow	Giving permission for children and adolescents to play outside in the neighborhood (McMinn et al., 2013).	"How often do you allow child to play out anywhere in neighborhood? "(McMinn et al., 2013)



Autonomy support	It is related to an atmosphere, having freedom or rights to talk or choose of being physical active based on the willingness of children (Gonzalez-Cutre et al., 2014). ²⁰	"I feel that my parents provide me with choices, options, and opportunities about whether to do active sports and/or vigorous exercise in my free time."(Gonzalez-Cutre et al., 2014; McDavid et al., 2012)			
Talk / Knowledge- sharing	It is about kids being able to express or understand issues or feelings during PA session (Kobayashi et al., 2019), and this support was also related to parents talking or comments towards the performance or sharing knowledge/beneficial effects of PA with child (Liu et al., 2017).	"How often do your parents tell you that you are doing well in physical activity or sports?"(Sanz-Martín, 2020)			
Fees/Financial support	Paying fees of lessons related to physical activity or organized physical activity (Liu et al., 2017).	"Do you provide financial support when your child participates in physical activity/exercise? "(Liu et al., 2017)			
Facilitation	Is also defined as logistic support (Van Kann et al., 2016).	"Do you facilitate your child in participating in sports or other activities that stimulate PA?"(Van Kann et al., 2016)			
Accompanying	Staying with children when they exercise (Liu et al., 2017).	"Do you accompany your child when he/she attends physical activity/exercise sessions?"(Liu et al., 2017)			
Plan	Detailed arrangement (e.g., time, place, frequency, contents) in advance to ensure children have adequate amount of movement or exercise (Hamilton & Schwarzer, 2018).	"How often to engage my child in at least 3 h of physical activity every day over the next week."(Hamilton & Schwarzer, 2018)			
Stimulation	Guiding and leading children's PA behaviors to be active (Liszewska et al., 2018).	"I make sure that my child travels actively on foot or by bicycle (with or without me) as often as possible."(Liszewska et al., 2018)			



Collaborative social	A tactic parents would employ	"How likely is it that you would participate in physical activity so the child could see it as a means of				
control	to increase children PA level by being role models for children(Liszewska et al., 2018)					
	2018).	ncreasing your child s physical activity?"(Liszewska et al., 2018)				
Positive social control	A control strategy (e.g., encouragement, or talking about pleasure of being active) adopted by parents (Liszewska et al., 2018).	"How likely is it that you would encourage your child to stick with his/her physical activity?"(Liszewska et al., 2018)				

Table 2 Punishment Style of Parental	Influence Definitions	and Example of C	Juestionnaire
Items			

Punishment style of	Definitions	Example of question items				
parental influence						
Pressure	Verbally stimulate	"Suggest that I lose				
	children to exercise more	weight."(Zarychta et al., 2016)				
	(Zarychta et al., 2016).					
Control / Negative social	Nag or strong rules	"How likely is it that you would				
control	captured by parents to	nag your child to be active as a				
	achieve goals of letting	means of increasing your child's				
	their kids being	physical activity?"(Liszewska et				
	physically active	al., 2018)				
	(Liszewska et al., 2018).					

Questionnaire Items					
Discouragement style of	Definitions	Example of question items			
parental influence					
Discouragement	The opposite way of	An observation system capture			
	encouragement. Parents	"restrains from action, redirects			
	may suppress children PA	or moves in another direction,			
	attempt by certain	pushes, spanks."(Klesges et al.,			
	behaviors and language	1986)			
	(Klesges et al., 1986).				
Restrictions /	Prevent or limit	"Do not play outside without			
Constraints / Rules	children's outdoor	permission or Stay close to or			
	activity and potential	within sight of the			
	risky behaviors (e.g.,	house/parent."(Crespo et al.,			
	playing rough games,	2013; Loprinzi et al., 2013)			

Table 3 Discouragement Style of Parental Influence Definitions and Example of	
Questionnaire Items	



climbing trees) due to
safety concern (Crespo et
al., 2013; Loprinzi et al.,
2013).



Appendix C Study Quality

Table 4 Risk of Bias Assessment Criterion Participants are randomly selected 1 2 3 4 Sample sizes are adequate Participants are representative of various demographic groups Exclusion of participants and justification 5 Group comparisons are made on other meaningful demographics Validated measures are used or authors have provided sufficient supportive information on psychometric properties they devised Measures used were defined and appropriate 7 8 Authors have examined whether dropouts are random or not (longitudinal/prospective study) 9 Drop-out rate was not high and missing data was treated appropriately (longitudinal/prospective design) 10 allocation sequence generated to produce comparable groups (experimental design only) allocation was concealed (experimental design only) 11 12 whether blinding was done; and if so, whether it was effective (experimental design only) Outcome data for all outcomes were reported; incomplete outcomes due to attrition 13 and exclusions were addressed (experimental design) 14 no selective outcome reporting (experimental design) 15 Other sources of bias (experimental design)



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Table 5	Risk	of Bias	Assessment

																Overall
Author (vear)	1	2	3	Δ	5	6	7	8	9	10	11	12	13	14	15	assessment
Klesges et al. (1986)	yes	na	na	low risk												
Sallis et al. (1988)	yes	na	low risk													
Sallis et al. (1988)	yes	na	na	low risk												
Brown et al. (1989)	yes	na	na	low risk												
Anderssen and Wold (1992)	yes	na	na	low risk												
Sallis et al. (1992)	yes	na	na	low risk												
Rossow and Rise (1994)	yes	na	na	low risk												
Biddle and Goudas (1996)	yes	na	na	low risk												
Yang et al. (1996)	yes	yes	yes	no	yes	yes	yes	yes	no	na	na	na	na	na	na	having potential risk of bias
Yang et al. (1996)	yes	yes	yes	no	yes	yes	yes	yes	no	na	na	na	na	na	na	having potential risk of bias
Yang et al. (1996)	yes	yes	yes	no	yes	yes	yes	yes	no	na	na	na	na	na	na	having potential risk of bias
Trost et al. (1997)	yes	na	na	na	na	na	na	low risk								
Vilhjalmsson and Thorlindsson (1998)	yes	na	na	low risk												
Trost et al. (1999)	yes	na	na	low risk												
McGuire et al. (2002)	yes	na	na	low risk												



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Dervisor et al (2002)																
Davison et al. (2003)	yes	na	na	na	na	na	na	na	na	low risk						
Ievers-Landis et al. (2003)	yes	na	na	na	na	na	na	na	na	low risk						
Welk et al. (2003)	yes	na	na	na	na	na	na	na	na	low risk						
Loucaides et al. (2004)	yes	na	na	na	na	na	na	na	na	low risk						
Arredondo et al. (2006)	yes	yes	no	yes	yes	yes	no	na	na	na	na	na	na	na	na	having potential risk of bias
Davison et al. (2006)	yes	na	na	na	na	na	na	low risk								
Ommundsen et al. (2006)	yes	na	na	na	na	na	na	na	na	low risk						
Raudsepp (2006)	yes	na	na	na	na	na	na	na	na	low risk						
DiNallo et al. (2007)	yes	na	na	na	na	na	na	na	na	low risk						
Gattshall et al. (2008)	yes	na	na	na	na	na	na	na	na	low risk						
Price et al. (2008)	yes	na	na	na	na	na	na	na	na	low risk						
Sabiston and Crocker (2008)	yes	na	na	na	na	na	na	na	na	low risk						
Anderson et al. (2009)	yes	na	na	na	na	na	na	na	na	low risk						
Crimi et al. (2009)	no	no	no	no	yes	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Ha et al. (2009)	yes	na	na	na	na	na	na	na	na	low risk						
Ha et al. (2009)	yes	na	na	na	na	na	na	na	na	low risk						
Edwardson and Gorely (2010)	yes	na	na	na	na	na	na	na	na	low risk						
Hardy et al. (2010)	yes	na	na	na	na	na	na	na	na	low risk						



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Heitzler et al. (2010)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Kelly et al. (2010)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Patnode et al. (2010)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Fisher et al. (2011)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Hendrie et al. (2011)	yes	no	no	yes	no	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Lee et al. (2011)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Nikolaidis (2011)	no	yes	no	no	yes	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Rosenkranz and Dzewaltowski (2011)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Wilson et al. (2011)	yes	yes	no	yes	no	yes	yes	yes	yes	yes	yes	no	yes	no	no	having potential risk of bias
Davison et al. (2012)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Dumith et al. (2012)	yes	yes	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	low risk
Lawman et al. (2012)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
McDavid et al. (2012)	no	no	no	yes	no	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Reimers et al. (2012)	no	yes	no	no	no	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Wilson and Spink (2012)	no	yes	yes	yes	no	yes	yes	no	yes	na	na	na	na	na	na	having potential risk of bias
Zhang et al. (2012)	no	yes	yes	no	no	yes	yes	na	na	na	na	na	na	na	na	having
The Education of Hong Kon For private study or resear Not for publication or fur	on Univ g Libra arch only ther rep	v ersity nry y.	n.													

																potential risk
Crespo et al. (2013)	yes	yes	yes	yes	yes	yes	yes	na	low risk							
Dewar et al. (2013)	yes	yes	no	yes	no	yes	yes	no	no	na	na	na	na	na	na	having potential risk of bias
Jackson et al. (2013)	no	yes	no	no	yes	yes	yes	na	having potential risk of bias							
Leary et al. (2013)	no	yes	no	no	yes	yes	yes	na	having potential risk of bias							
Loprinzi et al. (2013)	yes	no	no	yes	no	yes	no	na	having potential risk of bias							
McMinn et al. (2013)	yes	yes	yes	yes	yes	yes	yes	na	low risk							
Rutten et al. (2013)	yes	yes	yes	yes	yes	yes	yes	na	low risk							
Chen et al. (2014)	yes	yes	yes	yes	yes	yes	yes	na	low risk							
Farias Júnior et al. (2014)	yes	yes	yes	yes	yes	yes	no	na	having potential risk of bias							
Gonzalez-Cutre et al. (2014)	no	yes	no	no	no	yes	yes	na	having potential risk of bias							
Langer et al. (2014)	yes	yes	yes	yes	yes	yes	yes	na	low risk							
Lawman and Wilson (2014)	yes	yes	yes	yes	yes	yes	yes	na	low risk							
Lloyd et al. (2014)	yes	yes	yes	yes	yes	yes	yes	na	low risk							
Määttä et al. (2014)	no	yes	yes	no	no	yes	yes	na	having potential risk							
The Education of Hong Kon	on Univ g Libra	versity nry														

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																of bias
(Silva et al., 2014)	no	yes	no	no	no	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Ling et al. (2015)	yes	na	na	na	na	na	na	na	na	low risk						
Rhodes et al. (2015)	yes	yes	yes	no	no	yes	yes	no	yes	na	na	na	na	na	na	having potential risk of bias
Schoeppe and Trost (2015)	yes	na	na	na	na	na	na	na	na	low risk						
Tate et al. (2015)	yes	na	na	na	na	na	na	na	na	low risk						
Gontarev and Kalac (2016)	yes	na	na	na	na	na	na	na	na	low risk						
Gontarev et al. (2016)	yes	na	na	na	na	na	na	na	na	low risk						
Lee et al. (2016)	yes	na	na	na	na	na	na	na	na	low risk						
McMurray et al. (2016)	yes	na	na	na	na	na	na	na	na	low risk						
Silva et al. (2016)	yes	na	na	na	na	na	na	na	na	low risk						
Van Kann et al. (2016)	yes	na	na	na	na	na	na	na	na	low risk						
Verloigne et al. (2016)	no	yes	yes	no	no	no	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Wing et al. (2016)	no	yes	yes	no	no	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Zarychta et al. (2016)	no	yes	no	yes	no	yes	yes	yes	no	na	na	na	na	na	na	having potential risk of bias

Egmose et al. (2017)	ves	ves	ves	ves	ves	ves	ves	ves	ves	na	na	na	na	na	na	low risk
Garriguet et al. (2017)	yes	yes	yes	yes	yes	yes	no	na	na	na	na	na	na	na	na	having potential risk
																of bias
Gillison et al. (2017)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Larsen et al. (2017)	no	no	no	no	yes	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Liu et al. (2017)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Quick et al. (2017)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Tabak et al. (2017)	no	yes	no	no	yes	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Wang (2017)	no	yes	no	yes	no	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Wang et al. (2017)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
De la Torre-Cruz et al. (2018)	no	yes	no	no	yes	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Hamilton and Schwarzer (2018)	no	yes	yes	no	no	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Huffman et al. (2018)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Liszewska et al. (2018)	no	yes	yes	no	no	yes	yes	no	yes	na	na	na	na	na	na	having potential risk of bias
Prioreschi et al. (2018)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
Robbins et al. (2018)	yes	yes	yes	yes	yes	yes	yes	na	na	na	na	na	na	na	na	low risk
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Rodrigues et al. (2018)	yes	na	low risk						
Sevil Serrano et al. (2018)	no	no	no	yes	yes	yes	yes	na	having potential risk of bias
Wilk et al. (2018)	yes	na	low risk						
Biggs et al. (2019)	no	yes	no	yes	no	yes	yes	na	having potential risk of bias
Colabianchi et al. (2019)	yes	na	low risk						
Costa et al. (2019)	no	yes	no	no	yes	no	yes	na	having potential risk of bias
Courtney et al. (2019)	no	no	yes	no	yes	no	yes	na	having potential risk of bias
George et al. (2019)	yes	yes	yes	no	yes	yes	yes	na	having potential risk of bias
Haidar et al. (2019)	no	yes	yes	no	no	no	yes	na	having potential risk of bias
Kobayashi et al. (2019)	yes	na	low risk						
Lu et al. (2019)	yes	na	low risk						
Mikalsen et al. (2019)	yes	na	low risk						
Parker et al. (2019)	no	yes	no	yes	yes	no	yes	na	having potential risk of bias

Qurban et al. (2019)	no	yes	no	no	no	yes	yes	na	na	na	na	na	na	na	na	having potential risk of bias
Wang et al. (2019)	yes	na	na	na	na	na	na	na	na	low risk						
Welch et al. (2019)	yes	na	na	na	na	na	na	na	na	low risk						
Centeio et al. (2020)	yes	na	na	na	na	na	na	na	na	low risk						
Lee and Lee (2020)	yes	na	na	na	na	na	na	na	na	low risk						
Park and Park (2020)	yes	na	na	na	na	na	na	na	na	low risk						
Ren et al. (2020)	yes	na	na	na	na	na	na	na	na	low risk						
Sanz-Martín (2020)	yes	na	na	na	na	na	na	na	na	low risk						
Zarychta et al. (2020)	no	yes	yes	yes	no	yes	yes	no	yes	na	na	na	na	na	na	having potential risk of bias



Appendix D Standardised Parameter Estimates for Multi-Group Analysis of Gender

Table 8 Standardised Parameter Estimates for multi-group anlysis of gender

		Pa	rent			PE tea	achers		Peer					
	Во	ys	Girl	S	Bo	ys	Girl	S	Boy	'S	Girl	S		
	β	95%CI	β	95%CI	β	95%CI	β	95%CI	β	95%CI	β	95%CI		
Positive influence \rightarrow	.225***	.161, .289	.202***	.132, .271	.235***	.172, .299	.188***	.114, .261	.222***	.159, .285	.234***	.168, .300		
Intention														
Punishment \rightarrow Intention	.181	.016, .346	.239*	.084, .395	.236*	.080, .392	.261*	.114, .261	.241	.008, .474	.261*	.094, .429		
Dysfunction \rightarrow Intention	209	392,025	375**	554,196	-,276**	450,103	408**	616,201	284	535,032	373**	564,182		
Matar D.		timestag of the	and the la an	CEM south	11in a fam	antiainanta' aa	$\sim * \sim 0$	5 ** ·· < 01 *	** < 00	1				

Notes. Parameter estimates of the multiple-group SEM controlling for participants' age. * p < .05 ** p < .01 *** p < .001



Appendix **E**

Consent Form for Study 2

THE EDUCATION UNIVERSITY OF HONG KONG DEPARTMENT OF EARLY CHILDHOOD EDUCATION

CONSENT TO PARTICIPATE IN RESEARCH (FOR SCHOOL)

Study Title: Significant Others and Students' Leisure-Time Physical Activity Intention: A Prospective Test of the Social Influence in Sport Model

My school hereby consents to participate in the captioned research supervised by Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, 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, our right to privacy will be retained, i.e., the personal details of my students'/teachers' 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 students'/teachers' participation in the project are voluntary.

I acknowledge that we have the right to question any part of the procedure and can withdraw at any time without negative consequences.

Signature: Name of Principal/Delegate*: Post: Name of School: Date: (* please delete as appropriate)

(Prof/Dr/Mr/Mrs/Ms/Miss*)



INFORMATION SHEET

Study Title: Significant Others and Students' Leisure-Time Physical Activity Intention: A Prospective Test of the Social Influence in Sport Model

Your school is invited to participate in a project supervised Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, The Education University of Hong Kong.

The introduction of the research

A) What does the research involve?

Our study aim is to understand how significant others exert influence on children's sport experience.

B) Why were you chosen for this research?

We would like to recruit students between 11 to 18 years old who are able to understand the questionnaire and without any disability/disease that prevents from them participating in leisure-time PA.

The methodology of the research

A) How many participants will be included in this study We aim to recruit 2500 participants

B) Procedure of the research

Parents or legal guardians of the participants and the participants signed informed consent forms to ensure they understood the rights of their children's participation. Participants were asked to complete an online survey comprising measures of PSISS-2 and leisure-time PA intention at T1 (baseline), and T2 (1-month follow-up).

C) Potential benefits (including compensation for participation)

Those whom choose to participate will contribute to a better understanding and awareness of the influence of social influence.

The potential risks of the research

The risk for the present study is minimal. Please understand that your students'/teachers' participation are voluntary. They have every right to withdraw from the study at any time without negative consequences. All information related to your students'/teachers' will remain confidential. Any published paper or scientific report will not refer to any personal identifiers of particular participants.

Results of the Research Study

The findings of this study will be reported on the dissertation of The Education University of Hong Kong, and may be published in scientific journals.

If you would like to obtain more information about this study, please contact Su Linyi at telephone number **second second second**



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 <u>hrec@eduhk.hk</u> or by mail to Research and Development Office, The Education University of Hong Kong.

Thank you for your interest in participating in this study.

Su Linyi The Department of Early Childhood Education The Education University of Hong Kong



THE EDUCATION UNIVERSITY OF HONG KONG DEPARTMENT OF EARLY CHILDHOOD EDUCATION

CONSENT TO PARTICIPATE IN RESEARCH

Study Title: Significant Others and Students' Leisure-Time Physical Activity Intention: A Prospective Test of the Social Influence in Sport Model

I ______ hereby consent to my child participating in the captioned research captioned research supervised by Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, 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, our right to privacy will be retained, i.e., the personal details of my child 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 child's participation in the project is voluntary.

I acknowledge that we 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	
Name of Parent or Guardian	
Signature of Parent or Guardian	
Date	



INFORMATION SHEET

Study Title: Significant Others and Students' Leisure-Time Physical Activity Intention: A Prospective Test of the Social Influence in Sport Model

You are invited to participate with your child in a project supervised Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, The Education University of Hong Kong.

The introduction of the research

A) What does the research involve?

Our study aim is to understand how significant others exert influence on children's sport experience.

B) Why were you chosen for this research?

We would like to recruit students between 11 to 18 years old who are able to understand the questionnaire and without any disability/disease that prevents from them participating in leisure-time PA.

The methodology of the research

B) How many participants will be included in this study We aim to recruit 2500 participants.

B) Procedure of the research

Parents or legal guardians of the participants and the participants signed informed consent forms to ensure they understood the rights of their children's participation. Participants were asked to complete an online survey comprising measures of PSISS-2 and leisure-time PA intention at T1 (baseline), and T2 (1-month follow-up).

C) Potential benefits (including compensation for participation)

Those whom choose to participate will contribute to a better understanding and awareness of the influence of social influence.

The potential risks of the research

The risk for the present study is minimal. All participation is voluntary. Additionally, all individuals will have the right to withdraw from participation. There are no obligations for the study. All information related to your child will remain confidential. Any published paper or scientific report will not refer to any personal identifiers of particular participants.

Results of the Research Study

The findings of this study will be reported on the dissertation of The Education University of Hong Kong, and may be published in scientific journals.

If you would like to obtain more information about this study, please contact Su Linyi at telephone number **second second second**

If you or your child have/ has any concerns about the conduct of this research study, please do not hesitate to contact the Human Research Ethics Committee by email at <u>hrec@eduhk.hk</u> or by mail to Research and Development Office, The Education University of Hong Kong.




THE EDUCATION UNIVERSITY OF HONG KONG DEPARTMENT OF EARLY CHILDHOOD EDUCATION

CONSENT TO PARTICIPATE IN RESEARCH Study Title: Significant Others and Students' Leisure-Time Physical Activity Intention: A Prospective Test of the Social Influence in Sport Model

I ________ hereby consent to participate in the captioned research captioned research supervised by Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the Associate Professor/ student of The Department of Early Childhood Education, 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 we 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	
Name of Parent or Guardian	
Signature of Parent or Guardian	
Date	



Study Title: Significant Others and Students' Leisure-Time Physical Activity Intention: A Prospective Test of the Social Influence in Sport Model

You are invited to participate with your child in a project supervised Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, The Education University of Hong Kong.

The introduction of the research

A) What does the research involve?

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We would like to recruit students between 11 to 18 years old who are able to understand the questionnaire and without any disability/disease that prevents from them participating in leisure-time PA.

The methodology of the research

C) How many participants will be included in this study We aim to recruit 2500 participants

B) Procedure of the research

Parents or legal guardians of the participants and the participants signed informed consent forms to ensure they understood the rights of their children's participation. Participants were asked to complete an online survey comprising measures of PSISS-2 and leisure-time PA intention at T1 (baseline), and T2 (1-month follow-up).

C) Potential benefits (including compensation for participation)

Those whom choose to participate will contribute to a better understanding and awareness of the influence of social influence.

The potential risks of the research

The risk for the present study is minimal. All participation is voluntary. Additionally, all individuals will have the right to withdraw from participation. There are no obligations for the study. All information related to you will remain confidential. Any published paper or scientific report will not refer to any personal identifiers of particular participants.

Results of the Research Study

The findings of this study will be reported on the dissertation of The Education University of Hong Kong, and may be published in scientific journals.

If you would like to obtain more information about this study, please contact Su Linyi at telephone number **second second second**

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 <u>hrec@eduhk.hk</u> or by mail to Research and Development Office, The Education University of Hong Kong.





Appendix F

Questionnaire for Study 2

Research Introduction

I am a member of the research project team of The Education University of Hong Kong. I sincerely invite you to participate in a research on your personal experience of sports. The study requires participants to fill out a questionnaire that takes about 20 minutes to complete. All answers are not distinguished by correctness and error, nor are the difficult questions to answer. All the information provided by you is confidential and will not be provided to anyone other than the research group. All data will be used for this study only. Thank you for your participation! Date

Part 1

Please circle the appropriate Numbers to indicate the extent to which your coach, parents, and teammates will present their actions in your leisure-time physical activity. (If you have more than one coach or belong to more than one team, please answer with your

(If you have more than one coach or belong to more than one team, please answer with your most important coach or team.)

			Strongly disagree		neutral		Strongly agree	
1		My coach 1		2	3	4	5	
	In my sports program:	My parents	1	2	3	4	5	
	When I perform well ' he /she/ they praises me.	My teammates	1	2	3	4	5	
2	In my sports program:	My coach	1	2	3	4	5	
	When I do not perform well , he /she/ they	My parents	1	2	3	4	5	
	criticizes me.	My teammates	1	2	3	4	5	
3	In my sports program:	My coach	1	2	3	4	5	
	When I need help, he /she/ they supports me.	My parents	1	2	3	4	5	
		My teammates	1	2	3	4	5	
4	In my sports program: He /She/ They often makes me feel upset.	My coach	1	2	3	4	5	
		My parents	1	2	3	4	5	
		My teammates	1	2	3	4	5	
5		My coach	1	2	3	4	5	
	In my sports program:	My parents	1	2	3	4	5	
	when I do something good , he /she/ they encourages me.	My teammates	1	2	3	4	5	
6	T d	My coach	1	2	3	4	5	
	In my sports program: When I make mistakes the /she/ they makes me feel had	My parents	1	2	3	4	5	
	when I make inistakes a ne /she/ they makes he feet bad.	My teammates	1	2	3	4	5	
7		My coach	1	2	3	4	5	
	In my sports program:	My parents	1	2	3	4	5	
	He /Sne/ They respects me.	My teammates	1	2	3	4	5	
8	In my sports program:	My coach	1	2	3	4	5	



He /She/ They often has arguments/fights with me.	My parents	1	2	3	4	5
	My teammates	1	2	3	4	5

			Strongly disagree		neutral		Strongly agree
9		My coach	1	2	3	4	5
	In my sports program:	My parents	1	2	3	4	5
	for things I do.	My teammates	1	2	3	4	5
10		My coach	1	2	3	4	5
	In my sports program: When I do wrong things , he /she/ they reacts badly.	My parents	1	2	3	4	5
		My teammates	1	2	3	4	5
11		My coach	1	2	3	4	5
	In my sports program: He /She/ They understand me.	My parents	1	2	3	4	5
		My teammates	1	2	3	4	5
12	In my sports program:	My coach	1	2	3	4	5
	He /She/ They dose not respect my thoughts or opinions.	My parents	1	2	3	4	5
		My teammates	1	2	3	4	5
13	In my sports program:	My coach	1	2	3	4	5
	When I perform well , he /she/ they makes me feel	My parents	1	2	3	4	5
	good.	My teammates	1	2	3	4	5
14		My coach	1	2	3	4	5
	In my sports program:	My parents	1	2	3	4	5
	disappointed.	My teammates	1	2	3	4	5
15		My coach	1	2	3	4	5
	In my sports program:	My parents	1	2	3	4	5
	The /She/ They cares abouts me.	My teammates	1	2	3	4	5
16	T	My coach	1	2	3	4	5
	In my sports program: He /She/ They dose had things to me	My parents	1	2	3	4	5
	The fonce They dose bad things to me.	My teammates	1	2	3	4	5

Part 2 In this section, we will ask for your opinion on whether to continue your leisuretime PA.

Describe the extent to which you feel the following.

		Strongly			Strongly
		disagree	neu	tral	agree
1	I plan to do PA in my leisure time in the forthcoming month	1	2	3	4
2	I will try to put great effort into continuing my leisure time PA in the forthcoming month.	1	2	3	4



					103	
3	I plan to continue my leisure tim	e PA in the forthcoming month.	1	2	3	4
	Part 3 Personal Information Age:	Gender: <u>Male / Female</u>		Scho	ol:	
	Grade/Class:	Student ID:				
	*Email:					



Appendix G Consent Form for Study 3

THE EDUCATION UNIVERSITY OF HONG KONG DEPARTMENT OF EARLY CHILDHOOD EDUCATION

CONSENT TO PARTICIPATE IN RESEARCH (FOR SCHOOL)

Study Title: Significant others and children's mental toughness in sports: A longitudinal test of the Social Influence in Sport Model.

My school hereby consents to participate in the captioned research supervised by Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, 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, our right to privacy will be retained, i.e., the personal details of my students'/teachers' 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 students'/teachers' participation in the project are voluntary.

I acknowledge that we have the right to question any part of the procedure and can withdraw at any time without negative consequences.

Signature: Name of Principal/Delegate*: Post: Name of School: Date: (* please delete as appropriate)

(Prof/Dr/Mr/Mrs/Ms/Miss*)



Study Title: Significant others and children's mental toughness in sports: A longitudinal test of the Social Influence in Sport Model.

Your school is invited to participate in a project supervised Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, The Education University of Hong Kong.

The introduction of the research

A) What does the research involve?

Our study aim is to understand how significant others exert influence on children's sport experience.

B) Why were you chosen for this research?

We would like to recruit children between 7 to 12 years old with at least 6 months basketball experiences.

The methodology of the research

D) How many participants will be included in this study

We aim to recruit 150 participants: (1) 7-12 years old with at least 6 months basketball experience.

B) Procedure of the research

Parents or legal guardians of the participants and the participants signed informed consent forms to ensure they understood the rights of their children's participation. Participants were asked to complete a survey comprising measures of PSISS-2 and mental toughness at T1 (baseline), and T2 (1-month follow-up).

C) Potential benefits (including compensation for participation)

Those whom choose to participate will contribute to a better understanding and awareness of the influence of social influence.

The potential risks of the research

The risk for the present study is minimal. Please understand that your students'/teachers' participation are voluntary. They have every right to withdraw from the study at any time without negative consequences. All information related to your students'/teachers' will remain confidential. Any published paper or scientific report will not refer to any personal identifiers of particular participants.

Results of the Research Study

The findings of this study will be reported on the dissertation of The Education University of Hong Kong, and may be published in scientific journals.

If you would like to obtain more information about this study, please contact Su Linyi at telephone number **second second second**



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 <u>hrec@eduhk.hk</u> or by mail to Research and Development Office, The Education University of Hong Kong.

Thank you for your interest in participating in this study.



THE EDUCATION UNIVERSITY OF HONG KONG DEPARTMENT OF EARLY CHILDHOOD EDUCATION

CONSENT TO PARTICIPATE IN RESEARCH

Study Title: Significant others and children's mental toughness in sports: A longitudinal test of the Social Influence in Sport Model.

I ______ hereby consent to my child participating in the captioned research captioned research supervised by Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, 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, our right to privacy will be retained, i.e., the personal details of my child 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 child's participation in the project is voluntary.

I acknowledge that we 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	
Name of Parent or Guardian	
Signature of Parent or Guardian	
Date	



Study Title: Significant others and children's mental toughness in sports: A longitudinal test of the Social Influence in Sport Model.

You are invited to participate with your child in a project supervised Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, The Education University of Hong Kong.

The introduction of the research

A) What does the research involve?

Our study aim is to understand how significant others exert influence on children's sport experience.

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We would like to recruit children between 7 to 12 years old with at least 6 months basketball experiences.

The methodology of the research

E) How many participants will be included in this study

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B) Procedure of the research

Parents or legal guardians of the participants and the participants signed informed consent forms to ensure they understood the rights of their children's participation. Participants were asked to complete a survey comprising measures of PSISS-2 and mental toughness at T1 (baseline), and T2 (1-month follow-up).

C) Potential benefits (including compensation for participation)

Those whom choose to participate will contribute to a better understanding and awareness of the influence of social influence.

The potential risks of the research

The risk for the present study is minimal. All participation is voluntary. Additionally, all individuals will have the right to withdraw from participation. There are no obligations for the study. All information related to your child will remain confidential. Any published paper or scientific report will not refer to any personal identifiers of particular participants.

Results of the Research Study

The findings of this study will be reported on the dissertation of The Education University of Hong Kong, and may be published in scientific journals.

If you would like to obtain more information about this study, please contact Su Linyi at telephone number **second second second**

If you or your child have/ has any concerns about the conduct of this research study, please do not hesitate to contact the Human Research Ethics Committee by email at <u>hrec@eduhk.hk</u> or by mail to Research and Development Office, The Education University of Hong Kong.





THE EDUCATION UNIVERSITY OF HONG KONG DEPARTMENT OF EARLY CHILDHOOD EDUCATION

CONSENT TO PARTICIPATE IN RESEARCH

Study Title: Significant others and children's mental toughness in sports: A longitudinal test of the Social Influence in Sport Model.

I ________ hereby consent to participate in the captioned research captioned research supervised by Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the Associate Professor/ student of The Department of Early Childhood Education, 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 we have the right to question any part of the procedure and can withdraw at any time without negative consequences.



Study Title: Significant others and children's mental toughness in sports: A longitudinal test of the Social Influence in Sport Model.

You are invited to participate with your child in a project supervised Dr. Derwin King Chung CHAN, and conducted by Su Linyi, who are the student of The Department of Early Childhood Education, The Education University of Hong Kong.

The introduction of the research

A) What does the research involve?

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The methodology of the research

F) How many participants will be included in this study

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B) Procedure of the research

Parents or legal guardians of the participants and the participants signed informed consent forms to ensure they understood the rights of their children's participation. Participants were asked to complete a survey comprising measures of PSISS-2 and mental toughness at T1 (baseline), and T2 (1-month follow-up).

C) Potential benefits (including compensation for participation)

Those whom choose to participate will contribute to a better understanding and awareness of the influence of social influence.

The potential risks of the research

The risk for the present study is minimal. All participation is voluntary. Additionally, all individuals will have the right to withdraw from participation. There are no obligations for the study. All information related to you will remain confidential. Any published paper or scientific report will not refer to any personal identifiers of particular participants.

Results of the Research Study

The findings of this study will be reported on the dissertation of The Education University of Hong Kong, and may be published in scientific journals.

If you would like to obtain more information about this study, please contact Su Linyi at telephone number **second or email second se**

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 <u>hrec@eduhk.hk</u> or by mail to Research and Development Office, The Education University of Hong Kong.





Appendix H

Questionnaire for Study 3

Research Introduction

I am a member of the research project team of The Education University of Hong Kong. I sincerely invite you to participate in a research on your personal experience of sports. The study requires participants to fill out a questionnaire that takes about 20 minutes to complete. All answers are not distinguished by correctness and error, nor are the difficult questions to answer. All the information provided by you is confidential and will not be provided to anyone other than the research group. All data will be used for this study only. Thank you for your participation!

Date

Part 1 : Basic data										
1. Name	2. Age	3. Gender	4. Sport	4. How long have you been						
			type	playing this s	port					
	years old	Male/Female			years					
5. Hours of tra	aining per	6. Which of t	he competiti	ions have you parti	cipated in					
week		is th	ne highest le	vel of competition?	?					
	hours									
7.In the past y	ear: how	8. In the past 6 m	onths, how a	many times did you	u have a fight					
many times ha	ave you done	about training wi	th the follow	ving individuals?						
your personal	best in	$A \cdot Coach$	В·	C·	D・					
competitions?			Father	Mother	Peer					
	times	days	days	days	days					
9. Current edu	ication :	10. Living status	(with whom	?)						
Primary	grade	parents / fathe	r/mother/	alone/with other	S:					
11. How lor	ng have you	12. How long hav	ve you	13. How many te	ammates do					
been coachi	ing by your	been on your cur	been on your current sports you have on your sports team?							
current	coach?	team?								
	vears		vears							
L	years									

	Please circle the number that best represents your thoughts	Bad	d General			Good			
14.	How is your relationship with the coach?	1	2	3	4	5	6	7	
15.	How is your relationship with your teammates?	1	2	3	4	5	6	7	
16.	How is your relationship with your father?	1	2	3	4	5	6	7	



						114		
17.	How is your relationship with your mother?	1	2	3	4	5	6	7



Part 2:

Please circle the appropriate Numbers to indicate the extent to which your coach, parents, and teammates will present their actions in your sport. (If you have more than one coach or belong to more than one team, please answer with your most important coach or team.)

			Strongly disagree	neutral		Strongly agree
1	Please fill in each column \rightarrow	My coach	1 2	3	4	5
	In my sports program: \rightarrow	My father	1 2	3	4	5
	when I perform well', he /she/ they praises me. \rightarrow	My mother	1 2	3	4	5
		My teammates	1 2	3	4	5
2	In my sports program.	My coach	1 2	3	4	5
	When I do not perform well , he /she/ they	My father	1 2	3	4	5
	criticizes me.	My mother	1 2	3	4	5
		My teammates	1 2	3	4	5
3		My coach	1 2	3	4	5
	In my sports program:	My father	1 2	3	4	5
	when I need help, he /she/ they supports me.	My mother	1 2	3	4	5
		My teammates	1 2	3	4	5
4		My coach	1 2	3	4	5
	In my sports program: He /She/ They often makes me feel upset.	My father	1 2	3	4	5
		My mother	1 2	3	4	5
		My teammates	1 2	3	4	5
5		My coach	1 2	3	4	5
	In my sports program:	My father	1 2	3	4	5
	When I do something good , he /she/ they encourages me. My		1 2	3	4	5
		My teammates	1 2	3	4	5
6		My coach	1 2	3	4	5
	In my sports program:	My father	1 2	3	4	5
	When I make mistakes , he /she/ they makes me feel bad.	My mother	1 2	3	4	5
		My teammates	1 2	3	4	5
7		My coach	1 2	3	4	5
	In my sports program:	My father	1 2	3	4	5
	He /She/ They respects me.	My mother	1 2	3	4	5
		My teammates	1 2	3	4	5
8		My coach	1 2	3	4	5
	In my sports program:	My father	1 2	3	4	5
	He /She/ They often has arguments/fights with me.	My mother	1 2	3	4	5
_		My teammates	1 2	3	4	5



			Strongly disagree		neutral		Strongly agree
9	Please fill in each column → In my sports program: → He /She/ They is happy with me → for things I do. →	My coach	1	2	3	4	5
		My father	1	2	3	4	5
		My mother	1	2	3	4	5
		My teammates	1	2	3	4	5
10		My coach	1	2	3	4	5
	In my sports program:	My father	1	2	3	4	5
	When I do wrong things , he /she/ they reacts badly.	My mother	1	2	3	4	5
		My teammates	1	2	3	4	5
11		My coach	1	2	3	4	5
	In my sports program: He /She/ They understand me.	My father	1	2	3	4	5
		My mother	1	2	3	4	5
		My teammates	1	2	3	4	5
12	In my sports program: He /She/ They dose not respect my thoughts or	My coach	1	2	3	4	5
		My father	1	2	3	4	5
		My mother	1	2	3	4	5
	opmons	My teammates	1	2	3	4	5
13	In my sports program: When I perform well , he /she/ they makes me feel	My coach	1	2	3	4	5
		My father	1	2	3	4	5
		My mother	1	2	3	4	5
	good.	My teammates	1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	4	5	
14		My coach	1	2	neutral 3 4 3	4	5
	In my sports program: When I do not perform well • he /she/ they is disappointed.	My father	1	2	3	4	5
		My mother	1	2	3	4	5
		My teammates	1	2	3	4	5
15		My coach	1	2	3	4	5
	In my sports program: He /She/ They cares abouts me.	My father	1	2	3	4	5
		My mother	1	2	3	4	5
		My teammates	1	2	3	4	5
16		My coach	1	2	3	4	5
	In my sports program: He /She/ They dose bad things to me.	My father	1	2	3	4	5
		My mother	1	2	3	4	5
		My teammates	1	2	3	4	5

Please proceed to the second part...



Part 3 : Feeling of sports Describe the extent to which you feel the following.

	· · · · · · · · · · · · · · · · · · ·	Strongly		Strongly	
		disagree neutral		agree	
1	I interpret potential threats as positive opportunities.	1	2	3	4
2	I have an unshakeable confidence in my ability.	1	2	3	4
3	I have qualities that set me apart from other competitors.	1	2	3	4
4	I have what it takes to perform well while under pressure.	1	2	3	4
5	Under pressure, I am able to make decisions with confidence and commitment.	1	2	3	4
6	I can regain my composure if I have momentarily lost it.	1	2	3	4
7	I am committed to completing the tasks I have to do.	1	2	3	4
8	I am committed to completing the tasks I have to do.	1	2	3	4
9	I give up in difficult situations.	1	2	3	4
10	I get distracted easily and lose my concentration.	1	2	3	4
11	I worry about performing poorly.	1	2	3	4
12	I am overcome by self-doubt.	1	2	3	4
13	I get anxious by events I did not expect or cannot control.	1	2	3	4
14	I get angry and frustrated when things do not go my way.	1	2	3	4

