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STATEMENT OF ORIGINAL AUTHORSHIP

The work contained in this thesis has not been previously submitted for a degree or diploma at any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by other person except where due reference is made.

Signed:___________________________

Date:_____________________________
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This research study was divided into three phases. Phase I included 157 university undergraduate students. It was designed to assess the content (face) validity of the Leisure Exercise Efficacy Scale (LEES). Phase II consisted of 240 university undergraduates. This phase investigated the internal consistency, factorial structure, and construct validity of the LEES. Phase III was the main study, a total of 331 university undergraduate students were involved. It has three objectives: 1) to examine the theoretical relationships among the variables of “leisure exercise efficacy”, “leisure exercise motives”, “leisure exercise barriers”, and “leisure exercise behaviours” of university students using Social Cognitive Theory as the framework; 2) to assess the effect of a required physical education program, with interventions based on Bandura’s self-efficacy theory, on the leisure exercise behaviours of university students; and 3) to examine the role that the Hong Kong environment plays and identify possible ways to increase university students’ participation in leisure exercise. Path analysis results showed that leisure exercise efficacy was a significant and direct predictor of leisure exercise behaviours 3 months after the commencement of the semester. The re-specified Model of University Students’ Leisure Exercise Behaviours was found to be tenable. However,
repeated measures analysis of variance results showed that there were no significant 3-way interaction effects (Group x Gender x Assessment Time) or 2-way interaction effects (Gender x Assessment Time) (Group x Assessment Time) for all variables. Qualitative results showed three perceived leisure exercise barriers: 1) time; 2) attitudes towards exercise; and 3) structural. Three general dimensions emerged from the qualitative data to increase university students’ participation in leisure exercise: 1) reinforcement of leisure exercise efficacy; 2) enhancement of leisure exercise motives; and 3) encouragement of a university sports culture. Practical implications of the research findings and recommendations for future research are given in this study.

**Key words:** barrier, behaviour, exercise, Hong Kong, intervention, leisure, motivation, path-model, quantitative-qualitative, questionnaire, self-efficacy, undergraduate
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LIST OF ABBREVIATIONS

HE — High Exercisers

LE — Low Exercisers

LEBE — Leisure Exercise Behaviours

LEB — Leisure Exercise Barriers

LEBQ — Leisure Exercise Barrier Questionnaire

LEEI — Leisure Exercise Efficacy Intervention

LEE — Leisure Exercise Efficacy

LEES — Leisure Exercise Efficacy Scale

LEM — Leisure Exercise Motives

L — Light exercise

LTEQ — Leisure-time Exercise Questionnaire

M — Moderate exercise,

MPAM-R — Motivation for Physical Activities Measure-Revised

MUSLEB — Model of University Students’ Leisure Exercise Behaviours

NE — Non-Exercisers

NPEG — Non-Physical Education Group

PEG — Physical Education Group
PER — Intrapersonal Subscale

RPEP — Required Physical Education Programme

SCT — Social Cognitive Theory

SI — Sweat Inducing

ST — Strenuous Exercise

TIE — Time/Energy Subscale
CHAPTER 1
INTRODUCTION

Benefits, Determinants, and Interventions of Leisure Exercise

One of the promising health promotion approaches is leisure education for the meaningful use of leisure-time and participation in enjoyable physical activity (Ruskin, 2001). According to Caspersen, Powell, and Christenson (1985), physical activity is defined as any body movement produced by the skeletal muscles that results in a substantial increase over the resting energy expenditure. Among all types of physical activity, leisure activity is found to provide the greatest potential for the development of physical and mental health (U.S. Department of Health and Human Services, 1996). Leisure exercise is one form of leisure activities. Active participation in leisure exercise can help people achieve fitness and wellness (Barnekow-Bergkvist, Hedberg, Janlert, & Jansson, 1996; Gray-Lee & Granzin, 1997; Heath, Pate, & Pratt, 1993; Morrow Jr., 2000; Telama, Leskinen, & Yang, 1996). Thus, regular engagement in leisure exercise has the potential for numerous physical and mental benefits that contributes to personal enjoyment, personal growth, social harmony, and to social change.

To foster active participation in leisure exercise, considerable effort has
been expended to establish determinants of leisure exercise and to develop effective interventions. Social Cognitive Theory (Bandura, 1986) is frequently used by the investigators in research studies associated with determinants and interventions. Dishman & Sallis (1994) proposed the following exercise determinants: personal attributes (e.g. age, gender, race, etc), cognitive variables (e.g. barriers to exercise, exercise-efficacy, exercise motives, etc), behaviours (e.g. alcohol, school sports, past experience in exercise participation, etc), environmental factors/social environment (e.g. social support from peers/family/teachers, group cohesion, social isolation, etc), physical environment (e.g. climate, cost, access to facilities, etc), and perceived activity characteristics (e.g. perceived effort).

Interventions aim to get sedentary individuals to adopt regular leisure exercise and to help physically active people to maintain their regular leisure exercise behaviours. The design and implementation of interventions are complex and no conclusion has been made on the most effective strategy. However, research results that were drawn from past studies can provide valuable information on the selection of specific strategy for the change of leisure exercise behaviours. Consideration of the setting and target group is important in selecting interventions for leisure exercise behaviours (Buckworth, 2000).
Leisure Exercise and University Students

Exercise must be in the form of a regular pattern throughout the life span to optimize health benefits (Pender, 1998). University students undergo the transition from adolescence to early adulthood — a period where one seeks the most novelty and establishment for most individuals (Edginton, Jordan, DeGraaf, & Edginton, 2002). However, university students, a population which is understudied, are often criticized to be at risk of decreasing their leisure exercise (Wallace, Buckworth, Kirby, & Sherman, 2000). As university students spend most of their time on campus, their health and wellness can be improved through campus life and facilities. Universities need to adopt a whole-hearted approach to the promotion of life-time participation in leisure exercise (Daly, 2002), and play an important role in shaping the students’ leisure exercise behaviours (Sivan, 2001). Many universities provide a physical education programme designed to enhance students’ physical and mental fitness, and to encourage them to develop life-long habitual leisure exercise (Avery & Lumpkin, 1987; Ferguson, Yesalis, Pomrehn, & Kirkpatrick, 1989; Soudan & Everett, 1981). These programmes are in line with the guidelines provided by the Centers for Disease Control and Prevention for school and community programs, aimed at promoting lifelong physical activity among young people (U.S. Department of Health and Human Services, 1999). Universities need to identify ways to improve
the leisure exercise participation rate of students so that they can have better physical and mental health (Brawley, 1999).

While leisure exercise is found to be positively related to numerous health benefits, university students are found to be sedentary with increased risk for morbidity and mortality. Interventions for promoting leisure exercise are therefore important to improve students’ participation in leisure exercise. The implementation of a timely intervention is considered critical in achieving the goal of changing the leisure exercise behaviours of university students (Biddle & Mutrie, 2001).

**Overview of Exercise Behaviour Theories**

To better understand leisure exercise behaviours, it is essential to have a better understanding of exercise behaviour theories. Fundamental and applied social psychological theory and research have made important contributions to the understanding of exercise behaviours. According to Biddle and Nigg (2000), exercise behaviour theories can be classified into four categories: belief-attitude theory, competence-based theory, control-based theory, and decision-making theory. Since it is not the focus of the present study to compare these theories, only a general overview of each of the theories is presented below.
Belief-Attitude Theory

A belief is generally thought to mean any cognitive content held to be true. An attitude is formed from information one has obtained about someone or something that one forms an opinion or predisposition about. Belief-attitude Theory includes the Health Belief Model Theory, Protection Motivation Theory, and Theories of Reasoned Action and Planned Behaviour.

Health Belief Model Theory

The Health Belief Model (Janz & Becker, 1984; Rosenstock, 1974) is a belief theory originally developed to explain the public’s poor compliance with public health programmes. It postulates that there are four major cognitive components: 1) perceived probability of illness; 2) perceived severity of health threat; 3) perceived benefits of the recommended action to reduce health threat; and 4) perceived barriers to action. The model suggests that people will only develop desirable health behaviours if they possess the motivation and knowledge about health. However, the Health Belief Model was criticized for its limited applications to examining several health-related behaviours and increasing physical activity (Nahas, Goldfine, & Collins, 2003).
**Protection Motivation Theory**

Protection Motivation Theory (Rogers, 1975) provides a theoretical framework which accounts for some of the exercise behaviour determinants, particularly in the context of health-protective behaviours. In this theory, sources of environmental or intrapersonal information about a health threat initiate two cognitive processes: threat appraisal and coping appraisal. In the threat appraisal process, the health threat is evaluated in terms of the factors that increase or decrease the possibility of making a maladaptive response. Concurrently, individuals may make a coping appraisal, in which case, higher levels of response efficacy and self-efficacy will increase the chance of making an adaptive response.

**Theories of Reasoned Action and Planned Behaviour**

The Theory of Reasoned Action (Fishbein & Ajzen, 1975) has been constructed to help understand behavioural intentions of people so that social behaviours may be predicted by analysing the process of individual decision-making. This theory was criticized for not providing sufficient explanation for the important role of costs and barriers involved in behavioural choices (Kok, Den Boer, De Vries, Gerards, Hospers, & Mudde, 1992) since both are important in theory and practice. As an extension of the Theory of Reasoned Action, Ajzen (1985) developed the
Theory of Planned Behaviour by adding a factor of perceived behaviour control as a predictor variable. The goal of this theory is limited to explaining behaviours that are within the individual’s control (volitional). The theory posits that exercise behaviour is determined by an individual’s intentions to perform the behaviour. In other words, the proximal predictor of behaviour is an individual’s intention to perform the behaviour in a given context at a given time. The determinants of the intentions include attitudes, subjective norms, and perceived behavioural control. Attitude refers to an individual’s positive or negative evaluation of the behaviour, subjective norms refer to an individual’s perceived pressure from significant others on the behaviour, and perceived behavioural control refers to an individual’s control beliefs which takes into account individuals’ lack of volitional control over certain behaviours.

Competence-Based Theory

Competence may limit performance and yet it is a mediator which determines performance. Self-efficacy is one such mediator.

Self-efficacy Theory

Social Cognitive Theory (Bandura, 1986) consists of an interactive model
in terms of behavioural determinants. They are categorized into reciprocally influencing characteristics of the cognitive and personal, the behaviour, and the environment. Self-efficacy is a key concept in Bandura’s Social Cognitive Theory (1986). It affects people’s behaviours which includes their choice of action, level of performance in adverse situations, selection of useful task strategies, goal choice, and goal commitment. The theory posits that self-efficacy belief on behaviour is highly related to an individual’s actual ability to perform that behaviour. The wide use of the self-efficacy theory in exercise research compared to other exercise behaviour theories is mainly because its success in accounting for complex exercise behaviours and substantial past evidences in supporting the strong predictive ability on exercise behaviours (Allison, Dwyer, & Makin, 1999; Hagger, Chatzisarantis, & Biddle, 2001; Leveille, Cohen-Mansfield, & Guralnik, 2003; McAuley, Lox, & Duncan, 1993; Moritz, Feltz, Fahrbach, & Mack, 2000; Wakui, Shimomitsu, Odagiri, Inoue, Takamiya, & Ohya, 2002). It is important to emphasize here that unlike most other theories which postulate variable predictors to behaviour in general, self-efficacy theory focuses on the mediator — self-efficacy (which might be determined by other variables) to be predictor of behaviour in a specific domain or task. Details of this theory are discussed in the theoretical background of this chapter.
Control-Based Theory

This type of theory includes the Locus of Control and Self-determination Theory.

Locus of Control

The question of how a person looks upon himself/herself as being able to be in control is long seen as a personality issue that influences behaviour. Locus of control (Rotter, 1966) is a personality attribute reflecting the extent to which people perceive events to be under their control (internal locus) or under the control of chance, luck, or powerful others (external locus). Individuals that possess an internal locus of control take responsibility for their decisions and the outcomes of their decisions. Internal locus of control is important for people to feel self-directed, and to be self-motivated to continue to strive for challenges and develop a sense of self-competence. On the contrary, external locus of control will decrease people’s desire to persist in an activity that they feel unable to control.

Self-Determination Theory

Self-determination Theory (Deci & Ryan, 1985) is an extension of the Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980). It proposes that human motivation and psychological well-being are motivated by three
psychological needs: 1) autonomy (the need to initiate and regulate an individual’s behaviour); 2) competence (the need to produce and understand production of the behavioural outcomes); and 3) relatedness (the need to maintain satisfactory relationships with others and with the social order in general) (Deci & Ryan, 1990; Ryan & Deci, 2000). According to this theory, intrinsic motivation reflects a more internalized orientation, and extrinsic motivation reflects an underlying attitude of pressure and external control. When an individual participates in activities without pressure, they are fulfilling the need for autonomy. When individuals participate at a challenging skill level, they will develop ability and confidence that eventually creates a state of intrinsic motivation — a key outcome of self-determination.

Decision-Making Theory

Transtheoretical Model of Behaviour Change

The Transtheoretical Model of Behaviour Change (Prochaska & DiClemente, 1983) was originally developed to explain or predict change in addictive behaviours. It is a general model of intentional behaviour change and provides an integrative framework (cognitive, behavioural, and temporal aspects) for examining the process of health behaviour change. It suggests that any behaviour change is likely to occur through five interrelated stages: pre-contemplation (not
intending to make changes), contemplation (considering a change), preparation (making small changes), action (actively engaging in the new behaviour), and maintenance (sustaining the change over time). The progression of stages is not the same for all people. Some people may remain at certain stages while others may relapse to earlier stages.

So far, there has been no consensus on the “best” theory to examine exercise behaviours. Different theories have different emphases that are useful in one situation but less useful in another. Under different circumstances, researchers would have to choose different theories to investigate exercise behaviours. The chosen theory should be “appropriate” to provide them with the most suitable theoretical basis for their research questions.

**Theoretical Background**

Among all the theories related to exercise behaviour, Bandura’s self-efficacy theory (1997) is considered to be most suitable for this study. This theory is one of the most extensively used and holds considerable promise for investigating exercise behaviours (Desharnais, Bouillon, & Godin, 1986; Dzewaltowski, 1989; Johnson, Li, Epping, Lytle, Cribb, Williston, & Yang, 2000;

Self-efficacy Theory (Bandura, 1997) stemmed from Social Cognitive Theory (SCT) (Bandura, 1986). SCT suggests that behaviour, cognitive and personal factors, and environment interact as bidirectional determinants of one another. Thus this model of the three determinants is called the triadic reciprocality model. Self-efficacy belief is one of the cognitive and personal factors, and forms a major component of SCT. Bandura (1986) indicated that “among the different aspects of self-knowledge, perhaps none is more influential in people’s everyday lives than conceptions of their personal efficacy” (p. 390). Self-efficacy refers to an individual’s judgment of his/her own capability to accomplish a task at given levels and does not refer to a personality characteristic or trait. It influences human behaviours in four ways. 1) people’s choice of behaviour — humans tend to choose the tasks about which they feel competent and confident and avoid those in which they do not; 2) people’s effort expenditure and perseverance at the task — the higher
the sense of efficacy, the greater the effort expenditure and persistence; 3) people’s thought patterns and emotional reactions — high efficacy is responsible for feelings of confidence and serenity in approaching difficult tasks; and 4) it recognizes humans as producers rather than simply foretellers of behaviours — self-confidence breeds success which in turn breeds more challenging performance. It is possible to develop leisure exercise patterns and an active lifestyle, Bandura (1977) notes that self-efficacy may be important in this context. Consequently, the self-efficacy construct has been extensively studied in the exercise science and physical education field.

Self-efficacy and Exercise Behaviours

Self-efficacy has been applied in clinical psychology (Maddux & Lewis, 1995), health psychology (Ewart, 1995), and education (Schunk, 1995) by researchers to examine its effect on various dimensions. One of the areas commonly studied by researchers was self-efficacy and exercise. Self-efficacy was considered to play an important role in predicting exercise behaviours (Desharnais, Bouillon, & Godin, 1986; Dzewaltowski, 1989; Johnson, Li, Epping, Lytle, Cribb, Williston, & Yang, 2000; McAuley, 1992; McAuley & Jacobson, 1991; McAuley, Pena, & Jerome, 2001; Poag-DuCharme & Brawley, 1993; Sallis, Haskell, Fortmann,
In order to benefit from exercise, consistency in exercise participation is a key factor. Research suggests that self-efficacy has a positive effect on the change of exercise behaviours (Maddux, Brawley, & Boykin, 1995). When self-efficacy is linked to exercise, the type of self-efficacy is called exercise efficacy. The role of efficacy beliefs in initiating and maintaining a regular physical exercise program has been well documented (Fontaine & Shaw, 1995; Sallis, Hovell, Hofstetter, & Barrington, 1992). Winkel (1997) pointed out that literature showed mixed documentation on changes in probability of exercise participation due to changes in self-efficacy, thus there is a need for further research in this area.

**From Exercise Efficacy to Intervention**

King (1994) stated that intervention programs such as a personal intervention program, an interpersonal intervention program, an organizational/environmental intervention program, and an institutional/legislative intervention program promoted exercise participation. Many of the exercise intervention programmes employed specific behavioural techniques, and experimental studies played an important role in the development of exercise behaviour knowledge (Sallis & Hovell, 1990). Numerous research studies
investigated the intervention effects of the application of self-efficacy theory to the change of exercise behaviours. However, the results obtained were mixed. Keller, Fleury, Gregor-Holt, and Thompson (1999) reviewed published papers on the relationship between the SCT and physical activity. Out of the 27 reviewed papers, twelve employed an intervention in their studies, but only nine studies were found to have effects on self-efficacy.

The self-efficacy belief addresses how individuals judge their capabilities. If people judge that they are capable of performing certain behaviour, they are more likely to react, expend more effort, and persist even if they face adverse situations (Bandura, 1986). The perception of self-efficacy comes from four primary sources: 1) performance enhancement — past experiences of success or failure in a behaviour; 2) verbal/social persuasion — the influence of others informing an individual about capabilities and prompting their response; 3) social modelling/vicarious experience — the observation of others performing the behaviour and evaluating the consequences; and 4) physiological arousal — an individual’s physical feedback that accompanies performing the behaviour.
The Relationship between Exercise Efficacy, Exercise Motives, Exercise Barriers, and Exercise Behaviours

Exercise efficacy, exercise motives, and exercise barriers are important determinants of leisure exercise behaviours (Wu, Ronis, Pender, & Jwo, 2002). McAuley and Jacobson (1991) reported that exercise efficacy is a significant predictor of exercise behaviours over an eight-week low-impact aerobic fitness program for sedentary female adults. Keller, Fleury, Gregor-Holt, and Thompson (1999) examined the relationship between SCT and physical activity and found a positive relationship between self-efficacy and exercise behaviours. Exercise efficacy is considered to have a greater influence on the initial adoption stage of leisure exercise behaviours than in the maintenance stage (Bowles, Morrow Jr., Leonard, Hawkins, & Couzelis, 2002).

To understand leisure exercise behaviours, it is important to understand the reasons why people participate in leisure activities. Participation motives play a pervasive role in this aspect. The Self-determination Theory (Deci & Ryan, 1985, 1991) is recognized as a salient theoretical framework to examine motivation. Recently, Vallerand (1997) proposed the Hierarchical Models of Intrinsic and Extrinsic Motivation. In this model, there are three types of motivation: intrinsic motivation (participation in activity for pleasure and satisfaction), extrinsic
motivation (participation in activity for something outside the activity), and amotivation (the relative lack of motivation). Ryan, Frederick, Lepes, Rubio, & Sheldon (1997) proposed five kinds of exercise motives: enjoyment, appearance, social, fitness, and competence. The exercise motives could be divided into intrinsic and extrinsic motives. Among intrinsic motives were competence and enjoyment, and among extrinsic motives were appearance and fitness. For social motive, although it was extrinsic to exercise, it could add to one’s enjoyment in participation. Research suggested that intrinsic motivation is critical to exercise behaviours (Boothby, Tungatt, & Townsend, 1981; Perrin, 1979; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997; Weinberg et al., 2000). More interestingly, it was reported that intrinsic motivation is a good predictor of exercise behaviours (Oman & McAuley, 1993; Wankel, 1993) and it has positive relationship with exercise efficacy (Chase, 2001). Therefore individuals with higher exercise efficacy have higher exercise motives and participate more in leisure exercise. Extrinsic motives are critical factors for an individual to initiate their exercise programme, but intrinsic motives tend to contribute in sustaining leisure exercise over time (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997).

It is equally important to identify the barriers that prevent university students from participating in leisure exercise. Barriers can be either perceived or
real (Sechrist, Walker, & Pender, 1987). A perceived barrier is only an impression of an individual that hinders exercise participation. A real barrier is a true obstacle that stops an individual’s exercise behaviours. Perceived barrier was introduced in conjunction with the Health Belief Model (Janz & Becker, 1984; Rosenstock, 1966) and subsequently used to predict exercise behaviours (Tappe, Duda, & Ehrnwald, 1989). The awareness of barriers makes the studying of leisure exercise behaviours more successful (Bowles, Morrow Jr., Leonard, Hawkins, & Couzelis, 2002). Barriers may be individual, cultural, or environmental (Edginton, Jordan, DeGraaf, & Edginton, 2002). Many past studies have identified reasons why people refrain/withdraw from leisure exercise. However, research conducted provides little evidence of the relationship between leisure exercise efficacy and leisure exercise barriers. It was demonstrated that when measuring self-efficacy, potential perceived barriers should also be considered (Tsai, 2002). Perceived barriers have been shown to be associated with exercise behaviours (Sallis et al., 1989). The negative relationship between leisure exercise behaviours and leisure exercise barriers was identified by Conn (1998) using a path model. Leisure exercise barriers vary among individuals and groups. It is desirable for university students to identify and remove their leisure exercise barriers so that they can enjoy the benefits of leisure exercise.

To summarize, participation motives and perceived barriers to leisure
exercise are descriptive atheoretical approaches to understand leisure exercise behaviours (Biddle & Nigg, 2000). Self-efficacy Theory (Bandura, 1997) is a theoretical approach to provide further insight into leisure exercise behaviours and identify a deeper understanding of the improvement of leisure exercise behaviours.

The Hong Kong Case

It is widely accepted that a sedentary lifestyle is related positively with incidence of cardiovascular disease (National Center for Chronic Disease Prevention and Health Promotion, 2004). In Hong Kong, the second leading cause of death is cardiovascular disease that contributed to 14.1% of the total death rate (Hong Kong Government, 2002). Physical inactivity is one of the primary risk factors associated with cardiovascular disease that can be reduced through active participation in leisure exercise (Corbin & Lindsey, 1997). However, local researchers suggested that the fitness and physical activity levels of Hong Kong students were low (Fu, 1994; McManus & Armstrong, 1996; Ng, 1996a; Ng, 1996b). Their physical fitness level was lower than their counterparts in Canada, USA, Japan, and Mainland China (Fu, Cheung, Chow, Fung, & Ng, 2004). It was found that leisure exercise participation decreased with an increase in age (Lee & Ng, 1993; Ng, 1996b). About 80% of Hong Kong young adults exercised only once or less per week (Fu, Chow, Chung, & Louie,
Also they reported that a lack of leisure exercise behaviours among Hong Kong university students was problematic. It was suggested that more than 50% of university students have never or rarely participated in leisure exercise (Lindner & Speak, 1995). This phenomenon might be explained by the following factors: 1) Chinese culture and a competitive education system; 2) crowded living environment; and 3) lack of sports skill.

**Chinese Culture and Competitive Education System**

Leisure exercise is one of the domains that contribute to students’ positive attitude towards learning and good living habits. However, the Chinese culture emphasizes intellectual development and pays little attention to individuals’ physical and psychological development (Fu, 1993). Most parents put more emphasis on their children’s academic and career achievements and ignore the importance of leisure exercise benefits. This is in part due to the Hong Kong examination-oriented education system that has discouraged students from participating in leisure exercise.

**Crowded Living Environment**

In Hong Kong, as the school compound is normally small and crowded, it is not uncommon that primary school students are forbidden to run during their recess.
time for safety and discipline reasons. The crowded living environment results in inadequate sports and recreational facilities and Hong Kong students devote most of their leisure time on sedentary activities such as watching television, shopping, and playing computer games (Ng, 1996a).

**Lack of Sports Skill**

Although the government has recommended that secondary schools should provide students with two physical education classes each week, many schools do not include physical education classes for the senior forms such as grade 12 and 13. This has contributed to the vast range of university students’ sport skill levels. Lack of skill was reported to be one of the perceived leisure exercise barriers for Hong Kong students (Speak, Lindner, & Li, 1993) and thus lower skill may lead to low participation in leisure exercise.

The university plays an important role in advocating the importance of physical fitness and life-long leisure exercise habits (Calfas et al., 2000). Some universities in Hong Kong offer a required physical education programme for undergraduate students as part of the “whole person education”. However, no research had been conducted on the application of the exercise efficacy intervention
programme to the Hong Kong university students to improve their exercise behaviours. Recently, Macfarlane (1999) recommended introducing interventions to Hong Kong students to change their exercise behaviours. There is a dire need to develop a theoretical model to better understand the mediating mechanisms and to improve the leisure exercise participation of Hong Kong university students.

**Significance of the Study**

The lifestyle and culture of Hong Kong Chinese people are different from Western people (Hui, 2004). Most of the available research results on leisure exercise behaviours of university students have been obtained from the Western culture and little was found in the Asian context. Biddle (1995) suggested that:

> Despite the similarities in exercise and sport psychology in Europe and North America, we cannot rely on research findings from one geographical area to explain all human behaviour. We need more ‘cultural’ research in exercise and sport psychology, studying the cultural basis of psychological phenomena in sport and physical activity. (p. xii)

Many research studies conducted to date have been cross-sectional. Longitudinal and intervention studies are expected to contribute more to advances in research and theory (Pender, 1998).
In view of the high prevalence of sedentary lifestyle of Hong Kong university students, it is considered important to promote and develop leisure exercise behaviours within this population. The present study will generate more information on the effects of an intervention and the relationship of the selected variables on university students’ leisure exercise behaviours. This might eventually contribute to changes in policy and curriculum in schools and improvements in the quality of life of students.

The Purpose, Research Questions, Specific Objectives, and Definitions of Terms

Purpose of the Study

University students are the elite group and thus they should have more “time” and better “mood” to participate and enjoy in leisure exercise. Based on the literature review, it was identified that leisure exercise efficacy, leisure exercise motives, leisure exercise barriers, and leisure exercise behaviours were important determinants for leisure exercise and intervention was considered to be critical for the improvement of the university students’ participation in leisure exercise. The purpose of this study was thus to investigate the leisure exercise behaviours of university students from Hong Kong. To fulfil this purpose, the following research
questions and specific objectives were developed:

**Research Questions**

The general research question was framed as follows: What are the effects of leisure exercise efficacy, leisure exercise motives, and leisure exercise barriers on the leisure exercise behaviours of Hong Kong university students? Arising from this general question, two specific research questions were of particular interest to the investigator:

1. What are the contributions of the selected psychosocial variables (leisure exercise efficacy, leisure exercise motives, and leisure exercise barriers) in the prediction of university students’ exercise behaviours?

2. Does a 10-week intervention program increase the university students’ leisure exercise efficacy, leisure exercise motives, leisure exercise behaviours, and affect their leisure exercise barriers?

In attempting to answer the questions, the Leisure Exercise Efficacy Scale (LEES) and Leisure Exercise Barrier Questionnaire (LEBQ) were developed and validated to quantify respectively the leisure exercise efficacy and leisure exercise barriers of university students. A path model was introduced to answer the first question. The rationale for specifying this model is discussed in Chapter 5.
Furthermore, an intervention using Bandura’s self-efficacy theory (1997) as a theoretical framework was developed to answer the second question. Details of the content of the intervention are discussed in Chapter 6.

**Specific Objectives**

1. To establish a Leisure Exercise Efficacy Scale (LEES) for analysis in conjunction with self-reported leisure exercise behaviours.

2. To develop a Leisure Exercise Barrier Questionnaire (LEBQ) for analysis in conjunction with self-reported leisure exercise behaviours.

3. To test the contribution of the proposed model of psychosocial factors (leisure exercise efficacy, leisure exercise motives, and leisure exercise barriers) to university students’ leisure exercise behaviours.

4. To identify the levels of leisure exercise efficacy, leisure exercise motives, leisure exercise barriers, and leisure exercise behaviours of university students from Hong Kong.

5. To develop and implement a self-efficacy intervention programme within the university required physical education programme.

6. To evaluate the effect of the self-efficacy intervention programme by comparing changes in the leisure exercise efficacy, leisure exercise motives, leisure exercise
barriers, and levels of participation in leisure exercise.

7. To suggest strategies and programmes to improve Hong Kong university students’ leisure exercise behaviours.

Definitions of Terms

The terms used in this study are operationally defined as follows:

Leisure Exercise

Leisure is defined as free time and exercise is defined as a structured and planned physical activity that has the goal of maintaining or improving physical or psychological fitness.

Leisure Exercise Efficacy (LEE)

This is the belief that the university students hold regarding their capability to exercise. This construct is reflected by the total score that the students achieve on a 9-item Leisure Exercise Efficacy Scale (LEES) (Ng, Cuddihy, & Fung, 2003a). The scale is designed to assess the level of confidence that students have in maintaining an exercise program of more than fifteen minutes each week during their free time for three months. It comprises two subscales: Time/Energy subscale and
Intrapersonal subscale.

**Leisure Exercise Motives (LEM)**

This term is used to denote the perceived participation motives of university students to exercise during their leisure-time. The construct is reflected by the total score that students achieve on the Motivation for Physical Activities Measure-Revised (MPAM-R) (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Five general motives are included in the questionnaire: enjoyment, competence, appearance, fitness, and social. In this study, students were asked to respond to the possible participation motives to exercise during their free time.

**Leisure Exercise Barriers (LEB)**

This term is used to conceptualise university students’ perceived barriers to participate in exercise during their leisure-time. This construct is reflected by the total score that students achieve on the Leisure Exercise Barrier Questionnaire (LEBQ) (Ng, Cuddihy, & Fung, 2003b). Four subscales are included in the questionnaire: social and transport subscale, personal-excuses subscale, isolation subscale, and personal insecurity subscale. Students were asked to respond to the potential barriers to participation in exercise during their free time.
**Leisure Exercise Behaviours (LEBE)**

This term is used to represent the exercise behaviours of university students during their free time. This construct is reflected by a total leisure exercise score (METs per week) that students achieve on the Leisure-time Exercise Questionnaire (LTEQ) (Godin & Shephard, 1985). Students were asked to recall the average number of times (sessions longer than fifteen minutes) per week on strenuous (heart beats rapidly), moderate (not exhausting) and mild (minimal effort) exercise during their free time.
Research Progress Linking the Manuscripts

This thesis investigated the leisure exercise behaviours of Hong Kong university students. There are seven chapters in this thesis and the results are presented in three different chapters in the form of journal articles. All journal articles were published in peer-reviewed journals. The linkage of the thesis was determined by the sequence in which the study was conducted. The content of each chapter is briefly described as follows:

Chapter 1  Introduction

This chapter provides the background, significance, purpose, research questions, specific objectives, and definitions of terms of the study.

Chapter 2  Literature Review

A comprehensive literature review on leisure exercise efficacy, intervention, leisure exercise motives, and leisure exercise barriers on the change of leisure exercise behaviours.

Chapter 3  Methodology

This chapter attempts to document the research design, data collection,
procedures, participants, data analysis, measuring instruments, and ethical considerations.

**Chapter 4  Journal Article 1: The Development and Validation of a Leisure Exercise Efficacy Scale for University Students: A Hong Kong Study**

Part of this paper was published in the ACHPER Healthy Lifestyles Journal (Ng, Cuddihy, & Fung, 2003a). The purpose of this study was to develop and validate a Leisure Exercise Efficacy Scale (LEES) for Hong Kong university students.

**Chapter 5  Journal Article 2: Prediction of Leisure Exercise Behaviours — A Study on University Students of Hong Kong**

Part of this paper was published in the Journal of Physical Education & Recreation (Hong Kong) (Ng, Cuddihy, & Fung, 2003b). The purpose of this study was to examine the theoretical relationships among the variables of “leisure exercise efficacy”, “leisure exercise motives”, “leisure exercise barriers”, and “leisure exercise behaviours” of university students using SCT as a framework.
Chapter 6  Journal Article 3: Does A Required Physical Education Program Change Leisure Exercise Behaviours in Hong Kong University Students? — The Role of the Environment Explored

Part of this paper was published in the Journal of Exercise Science and Fitness (Ng, Cuddihy, & Fung, 2003c). The purpose of the study was to examine the effect of a Required Physical Education Program with leisure exercise efficacy interventions on the change of leisure exercise behaviours for university students — the role that the Hong Kong environment plays and to identify possible ways to increase university students’ participation in leisure exercise.

Chapter 7  Conclusions

This chapter concludes the research findings. The implications of findings, limitations of the study, and recommendations for further research are discussed.
CHAPTER 2

LITERATURE REVIEW

There are three major areas in the literature review. As the theoretical framework of this study is built on Bandura’ self-efficacy theory, the first major area is on the self-efficacy theory with sub-sections to describe the definitions of self-efficacy, the determinants of self-efficacy, the measuring instrument of self-efficacy, and its predictive role in exercise behaviours. The second major area is on the intervention to review the effect it has on the improvement of exercise behaviours. The third major area is on the other two selected psychosocial variables of LEBE — LEM and LEB. The sequence of arranging the literature in each section is according to the year of publication so that readers can trace the trend for the reviewed variables.

Self-efficacy

Bandura’s Self-efficacy Theory

Self-efficacy theory developed within the framework of SCT (Bandura, 1986) posits self-efficacy as a common cognitive mechanism for mediating
behavioural responses, and states that psychological procedures alter the level and strength of the belief that one can successfully execute given tasks. In SCT, there is a multifaceted causal structure to explain the development of competencies and the regulation of action; what people think, believe, and feel that affects their behaviours. This theory consists of many classes of determinants that operate as regulators and motivators of established cognitive, social, and behavioural skills. Perceived self-efficacy plays a key role in SCT because it acts upon other determinants. Efficacy beliefs influence people’s courses of action, effort, perseverance in the face of obstacles and failures, resilience to adversity, whether thought patterns are self-hindering or self-aiding, stress and depression in taxing situations, and level of accomplishment realized. Self-efficacy belief is understood to be a good predictor of people’s subsequent performance, however, this is only tenable when proper incentives and the necessary skills are present.

Definitions of Self-efficacy

Initially, Bandura (1977) defined self-efficacy as a rather specific type of expectancy about one’s beliefs in one’s ability to perform a specific behaviour required to produce an outcome. Bandura (1989) further expanded the definition as people’s beliefs about their capabilities to exercise control over events that affect
their lives. Bandura (1990) revised the definition to be people’s beliefs in their capabilities to mobilize the motivation, cognitive resources, and courses of action needed to exercise control over task demands. Bandura (1997) further defined perceived self-efficacy as “one’s capabilities to organize and execute the courses of action required to produce given attainment” (p. 3).

**Determinants of Self-efficacy**

In self-efficacy theory, individual beliefs about one’s capabilities are the product of the interaction of information from four principal sources (Bandura, 1997). They have different power in influencing self-efficacy beliefs: First, performance enhancement (enactive attainment and actual experience) is the most influential source. Success raises self-efficacy and failure lowers it. Second, verbal/social persuasion — the persuaders play an important role in the development of an individual’s self-beliefs. Third, social modelling/vicarious experience (observational learning, modelling, imitation) — the effect of modelling is important in this context, especially when the individual has little prior experience with the task. Social comparisons and evaluation of others’ performance are also relevant to it. Fourth, physiological arousal — physiological and affective states factors such as stress, arousal, fear reactions, fatigue, aches, and pains also provide information about
efficacy beliefs. An individual’s physiological state is perhaps a key indicator of their presence. Their association with poor behavioural performance, perceived incompetence, and perceived failure influences self-efficacy.

**Measuring Instrument of Self-efficacy**

The purpose of a self-efficacy scale is to assess the strength of participants’ belief in their ability to achieve certain performance levels under various adverse situations. Bandura (1997) stated that:

Self-efficacy scales should measure people’s beliefs in their abilities to fulfil different levels of task demands within the psychological domain selected for study. Including a wide range of task demands identifies the upper limits of people’s beliefs in their capabilities as well as gradations of strength of perceived self-efficacy below that point. (p. 44)

For the scale to be valid, the situational statements to which participants are asked to respond must be focused on the specific task of interest only. Self-efficacy judgements vary on three dimensions, namely “level”, “strength”, and “generality”. Level pertains to the nature of the challenges against which self-efficacy is measured. This includes the level of ingenuity, exertion, accuracy, productivity, threat, and self-regulation required. Strength refers to a person’s level of persistence in the task.
The stronger the sense of self-efficacy, the greater the perseverance and the higher the likelihood the task can be performed successfully. Therefore, it is recommended that the action words used in the situational statements of the scale should be “can do” rather than “will do”. It is also recommended that in developing the scoring system, the response scores should be in 10-unit intervals ranging from 0 (cannot do), through 50 (moderately certain can do), to 100 (certain can do). People’s judgement of their competence in the task can vary across a wide range of situations. These situations include the degree of similarity of the activity, the modalities in which capabilities are expressed (behavioural, cognitive, affective), and the qualitative features of the situations. Therefore the self-efficacy scale must have specific situations that people may encounter and reflect people’s efficacy judgements over these situations. This can help minimize the difference in generality of different persons to different situations disrupting the accuracy of the efficacy measurement.

Nowadays, many studies on self-efficacy contain a scale developed by the investigator to serve the purpose of that particular study. A summary of some of the studies reviewed is presented below:

In a study conducted by Sallis, Pinski, Grossman, Patterson, and Nader (1988), an exercise behaviour self-efficacy scale was developed. The main purpose of the study was to identify behavioural and situational structures of exercise change.
The draft self-efficacy scale was administered to 171 participants. Principal component analysis with varimax rotation was used to determine the factor structure of the scale. It consisted of 11 factors, accounting for 69% of the variance. Those factors which contained only two to three items were deleted. Only those two factors having eigenvalues > 2.0 were retained. The two factors were identified as “resisting relapse” (five items) and “making time for exercise” (seven items). The test-retest reliabilities for the factors were both .68. Cronbach’s alpha provided the alpha coefficients at .83 and .85 for the internal consistency. The inter-correlation for the factors was .55. Concurrent criterion-related validity was assessed. It was found that the factors were significantly correlated with reported exercise habits. The factors were compared with reported variables by one-way ANOVA to show the specificity of the ratings. The correlations between self-efficacy factors and the Multidimensional Health Locus of Control were calculated to determine the construct validity. All these tests showed that this newly developed scale was reliable and valid. The factors were however, not significantly related to gender, race, and age.

The relationship of the stages of readiness to exercise, the self-efficacy, and the pros and cons of exercising was measured by a 5-item self-efficacy scale (Marcus & Owen, 1992). The scale was developed to measure the exercise confidence of the
1,093 employees of four Rhode Island worksites and 801 employees in Adelaide of Australia. It included three factors: negative affect, resisting relapse, and making time for exercise. A 7-point scale was used to rate each of the five items with 1 representing “not at all confident” and 7 representing “very confident”. The internal consistencies for the two sample groups were .85 and .80. Results indicated that the total scores of the scale could reliably differentiate employees at different stages of exercise.

A self-efficacy questionnaire was designed to solicit coaches’ beliefs on the effectiveness of the listed coaching strategies in building tennis players’ confidence in performance (Weinberg, Grove, & Jackson, 1992). There were 13 strategies on the questionnaire. The coaches were asked to rate their belief on a 5-point Likert scale (1 = not effective, 3 = somewhat effective, and 5 = very effective). Descriptive data on the self-efficacy strategies were listed. All strategies were found to be at least moderately effective in enhancing performance.

The relationship between self-efficacy and perceptions of exertion was investigated by an 8-item self-efficacy scale (Rudolph & McAuley, 1996). Fifty undergraduate males were recruited for the study. The exercise self-efficacy scale was employed to test the participants’ confidence in their capability to successfully complete successive 10-minute treadmill running at a moderately fast speed. The
scale was a 100-point percentage scale with 10-point increments so that 10% indicated highly uncertain and 100% indicated completely certain. Self-efficacy scores were the mean of the total score of the eight items. It was reported that the internal consistency of the scale was greater than .95. The findings supported Bandura’s theoretical framework of self-efficacy. Those with high self-efficacy reported lower perceptions of effort and strain during exercise.

A self-efficacy scale has also been developed and validated to measure psychosocial influences on preadolescent children’s physical activity. Saunders et al. (1997) developed a self-efficacy scale which contained three factors: support-seeking, barriers, and positive alternatives with internal consistency reliabilities of .71, .71, and .54 respectively. The test-retest reliability coefficients for the scales were .76, .82, and .61 respectively. The self-efficacy scale was found to be significantly correlated with intention to participate in physical activity.

Geister and Leith (1997) assessed the effects of self-efficacy on soccer penalty shot performance. Forty male varsity soccer players were randomly assigned to high/low self-efficacy groups according to their scores on a self-efficacy rating scale. The scale was a 10-point Likert scale to indicate participants’ perceived ability in the task. It ranged from 1 (not as good as most other players) to 10 (better than most other players). Participants who scored six or above were grouped into the high
self-efficacy group and those scored five or below were grouped into low self-efficacy group. No significant differences were found between the high and low self-efficacy groups.

A self-efficacy questionnaire was developed by Garza and Feltz (1998) to examine the effectiveness of mental practice techniques for improving self-efficacy. The participants were 27 female competitive figure skaters with ages ranged from 10 to 18 years. The questionnaire referred to three skills: jumps, spins, and steps/connecting moves. Participants were asked to rate their level of belief in performing the skill listed accurately from at least 1 out of 10 times to 10 out of 10 times. The rating ranged from 0 (I am certain I can do this) to 10 (I am very certain I can do this). The scores were the sum of all the items within a skill. The result only partially supported the hypothesis that mental practice could improve the self-efficacy of figure skaters.

Use of self-efficacy scales is not restricted to cross-sectional studies. In a recent study conducted by Bourdeauduij, Sallis, and Vandelanotte (2002), an 11-item self-efficacy scale was used to track a group of young adults for seven years. At baseline, there were 980 respondents (mean age = 21) and at the end of data collection, only 172 respondents left for data analysis. The respondents were asked to indicate their perceived confidence to continue exercise under difficult conditions.
The sum of the scale, scored on a 3-point Likert scale was used to evaluate self-efficacy. The Cronbach’s alpha of the scale was reported to range from .88 to .91.

**The Role of Leisure Exercise Efficacy in the Prediction of Leisure Exercise Behaviours**

Previous research suggested that there is a positive relationship between self-efficacy and exercise behaviours. All these studies employed a self-efficacy scale to measure perceived self-efficacy. A summary of the literature review is presented below.

Desharnais, Bouillon, and Godin (1986) predicted the adherence to exercise from expectations of both outcome and self-efficacy in a physical fitness program. Twenty-eight men and seventy women were assessed. The physical fitness program lasted for 11 weeks, with two sessions per week. The subjects completed a questionnaire which measured expectations of outcome and expectations of self-efficacy at the first session. Adherence was determined from the attendance records. Results indicated that expectations of self-efficacy best distinguished adherers from dropouts and the standardised discriminant coefficient was reported to be .93. It was concluded that self-efficacy was a better determinant than expectations
of outcome in exercise adherence.

A self-efficacy scale was used as one of the instruments in comparing the Bandura’s SCT and Fishbein and Ajzen’s Theory of Reasoned Action to predict exercise behaviours (Dzewaltowski, 1989). Three hundred and twenty eight subjects were assessed on the theories’ constructs and their exercise behaviours. The self-efficacy score was the average of their response to the scale ranged from 0 to 100. The scale consisted of the following items: in spite of your work schedule, when physically fatigued, when exercise is boring, with minor injuries, in spite of other time demands, and in spite of family responsibilities. The zero-order correlations indicated that self-efficacy accounted for almost twice as much variance in exercise behaviour compared to self-evaluated dissatisfaction. The beta F values for self-efficacy and self-dissatisfaction were 23.85 and 7.91 respectively. Results showed that self-efficacy was a strong predictor of exercise behaviours.

Reynolds et al. (1990) employed an 8-item self-efficacy scale to determine the relationship of physical activity and self-efficacy. The ratings ranged from 1 “strongly agree” to 6 “strongly disagree”. In this case, a low score represents a high level of self-efficacy. The items were mixed with other two predictor items, i.e. the intention and direct social influence. The Cronbach’s alpha generated for self-efficacy was .89. The correlations between the total activity and self-efficacy for
both genders ranged from -.28 to -.46 (p < .0001). The significant negative correlations indicated that a high degree of self-efficacy is related to higher levels of physical activity. Results suggested that there was significant correlation between self-efficacy and physical activity in adolescents.

Garcia and King (1991) used a 14-item self-efficacy scale to predict long-term adherence to aerobic exercise. The participants were told to rate their confidence over the next six months to exercise at their target heart rate three to five times per week for 30 to 40 minutes under certain situational circumstances. The ratings ranged from 0 to 100 with a 10-unit interval. If 13 of the items were completed, the average of the ratings was used as their total scores. The Cronbach alpha of this scale is .90 and the test-retest correlation was .67 (n = 62, p < .001). It was found that self-efficacy was significantly associated with exercise adherence at both six months (r = .42, p < .001) and one year (r = .44, p < .001).

A study by Biddle, Goudas, and Page (1994), based on the Theory of Planned Behaviour (Ajzen, 1985), together with the variables of benefits, barriers, and self-efficacy, assessed the self-reported and intended physical activity in a university workforce sample. They used a 3-item self-efficacy scale to determine the confidence of the subjects to exercise over one week, one month and six months. An 8-point Likert scale was designed for the scale. The internal reliability of the scale
was .91. It was found that the intention to exercise correlated with self-efficacy ($r = .64, p < .01$) and strenuous physical activity ($r = .52, p < .01$).

Self-efficacy was suggested to be a better predictor of physical activity in a group of chronic heart failure patients than measures of physical fitness or rating of perceived exertion during activity (Oka, Gortner, Stotts, & Haskell, 1996). Forty-three patients aged 33 to 91 years of age participated in this study. They were asked to perform a treadmill test and to complete activity logs for two consecutive days. Self-efficacy beliefs for physical activity were assessed by the 17-item self-efficacy expectation scale. The overall model explained 38% of the variance ($p < .001$). Self-efficacy ($p = .015$) was found to be the strongest predictor of physical activity in this population.

A previous study demonstrated self-efficacy to be an important correlate of vigorous physical activity for a group of fifth grade students (Pate, Trost, Felton, Ward, Dowda, & Saunders, 1997). According to their self-reported exercise behaviour level, the 361 participants were classified into moderate and vigorous physically active groups. Two physical activity scales were used to assess the participants' self-efficacy in support seeking, overcoming barriers, and competing activities. Result from the logistic regression analysis showed that there was significant association between self-efficacy (support seeking) and participation in
vigorous physical activity (adjusted odds ratio = .79, 95% CI = .67 to .96).

Wakui, Shimomitsu, Odagiri, Inoue, Takamiya, and Ohya (2002) conducted a cross-sectional study with 450 female Japanese university students (aged 18-21) to assess the relationship between stages of change for exercise behaviours and exercise/dieting related psycho-behavioural factors. Exercise self-efficacy was assessed by a 5-item measure developed for this study. MANOVA and one-way ANOVA results showed that self-efficacy was an important predictor of exercise behaviours ($F[4, 449] = 18.10, p < .001$).

Leveille, Cohen-Mansfield, and Guralnik (2003) examined the relationship between exercise self-efficacy and physical activity in a group of 75-85 year-old adults with musculoskeletal pain. There were 325 participants in this study. Exercise-attitudes, exercise beliefs, and self-efficacy were included in a single logistic regression model. Of the three variables, self-efficacy was reported to be the only factor that was independently associated with sedentary behaviour (adjusted odds ratio = 2.24, 95% CI = 1.12 to 4.47). A 3-item exercise efficacy scale (Lorig, Stewart, Ritter, Gonzalez, Laurent, & Lynch, 1996) was employed to assess the exercise efficacy. Their findings suggested that self-efficacy was strongly associated with physical activity and improving exercise efficacy might be important in physical activity program for adults with chronic musculoskeletal pain.
Recently, the positive and influential role of exercise efficacy in determining the exercise behaviours of university students was reported by Wallace & Buckworth (2003). They examined the relationship between the exercise efficacy, social support, and sedentary behaviour and longitudinal shifts in exercise stages of change on 161 university students. Subjects were asked to respond to a valid and reliable questionnaire both at baseline and follow up (six months later). Results showed that exercise self-efficacy was significantly decreased for relapers ($t_{11} = 3.84, p < .01$) and reflected that exercise self-efficacy was more important in predicting relapse than adoption of exercise.

**Intervention**

*Intervention on the Change of Leisure Exercise Behaviours*

According to Marcus (1995), there are three major factors that determine physical activity behaviour: personal, psychological, and environmental. Among various psychological factors, self-efficacy, self-motivation, and perceived benefits of exercise were found to have high correlations with active participation in physical activity. Psychological factors such as goal setting, self-reinforcement, and personal skills such as self-monitoring of self-regulatory skills were found to have predictive
ability of exercise participation. Family social support and the type, complexity, convenience, and cost of physical activity programs were other factors identified in the environmental domain. Three kinds of intervention were suggested: community-based intervention (goal setting, feedback, problem solving, self-reinforcement, and self-monitoring), physician-based intervention (counselling), and worksite-based intervention (worksite health promotion and educational campaign).

There are many studies on the development of an intervention program to improve self-efficacy and participation in exercise/physical activity:

Weinberg, Gould, and Jackson (1979) examined one of the four intervention techniques of efficacy expectations and performance vicarious experience in a study. Thirty males and thirty females were used to test Bandura’s self-efficacy theory (1977) in a competitive, motor-performance situation. They were randomly assigned to either a high or low self-efficacy condition. Two males and two females were in one testing session. There was always a confederate of the experimenter in the testing sessions. The task required the subjects to stretch and maintain their legs one at a time to a horizontal position. They were asked to compete with each other. Self-efficacy was manipulated before performing the task, with the low self-efficacy subjects led to believe that they could not win the competition and they finally lost
the competition. Results showed that high self-efficacy subjects performed better than the low self-efficacy subjects. This study suggested a positive relationship between efficacy expectations and performance.

The effect of an efficacy-based intervention in exercise adherence was assessed in a sample of middle-aged adults (n = 114) (McAuley, Courneya, Rudolph, & Lox, 1994). The 20-week exercise intervention was based on the four sources of self-efficacy: mastery accomplishments, social modelling, social persuasion, and physiological states. Mastery accomplishment: participants were asked to complete a daily log that was discussed with the investigators in the intervention meetings. Social modelling: the participants were shown videotapes of middle-aged sedentary people engaging in various stages of exercise participation. Social persuasion: the participants were grouped into two to three to provide assistance and encouragement to each other. Physiological responses: handouts were given to provide information to the participants on the natural physiological responses of the body to exercise, so as to make them stronger and fitter. The control participants only engaged in an intervention that was not expected to have an influence on exercise participation. It was found that self-efficacy has a significant effect on the prediction of exercise behaviours that appeared after the first month of intervention.

Behavioural based counselling interventions were used in a study with a
group of physicians so that they may better counsel their patients (Calfas, Sallis, Oldenburg, & Ffrench, 1997). The PACE (physician-based assessment and counselling for exercise) intervention was designed for different participant stages of readiness to exercise. Pre-contemplators received primary cognitive counselling such as identification of benefits and consideration to become physically active. Contemplators and those in the action stage were taught specific behavioural strategies such as ways to elicit social support, goal setting, and barrier solving. The control and intervention subjects received notification of the scheduled office visit 3-6 weeks beforehand. Baseline measures were collected before the visit. During the visit, intervention participants received PACE counselling and the control participants did not. Two weeks after the visit, the participants were contacted to discuss their activity goals. Four to six weeks after the office visit, all participants were measured again. A 12-item self-efficacy scale was employed to measure self-efficacy for physical activity. The family and friend social support for exercise scales was used to rate the frequency of support. Results showed that with intervention, participants significantly increased physical activity compared with the controls. The PACE intervention was found to affect the cognitive and behavioural processes of change but not social support nor self-efficacy. The results also suggested that instructions to elicit social support were not effective after 4 to 6
weeks. This applied to self-efficacy improvements also. Therefore, a supervised program for enhancement of self-efficacy was recommended.

A three-level incentive program was examined to promote regular moderate physical activity (Cole, Leonard, Hammond, & Fridinger, 1998). The participants were 3,740 employees from an agency, with only 1,192 participants included in the final data analysis. A one-group pre-test/post-test design was employed. The PACE scale was used to classify the participants level of physical activity. Indication of changes in physical activity was based on a modified version of Transtheoretical Model. The name of the intervention program was “Director’s 50th Anniversary Physical Activity Challenge”. This was a 50-day intervention program that requested the participants to set goals in a behaviourial contract, and record their activity level on their activity record. Results indicated that intervention had an effect on increasing physical activity — more than one third of the participants advanced one or more stages after the intervention.

A tailor-made self-help intervention program for exercise adoption was compared to a standard self-help exercise promotion intervention (Marcus et al., 1998). The subjects were 1,559 employees at eleven different worksites. The two intervention groups received self-help exercise promotion materials either motivationally tailor-made to the participants’ stage of change or standard. The
motivationally tailor-made intervention consisted of five self-help manuals, one for each of the five stages of change. Examples of the content were: focus on increasing awareness of the benefits of activity, perceived and prevention of barriers, rewarding oneself, enhancing confidence, and goal setting. The materials were given to the participants at baseline and one month later. Data were collected both at baseline and after three months. The participants were asked to complete the measure of stage of motivational readiness for exercise and the 7-Day Physical Activity Recall. Results showed that those in the motivationally tailor-made group were more likely to have advancement in their stage of motivational readiness and have positive changes in self-reported time spent in exercise.

A four-session worksite intervention was developed to examine its effect on selected SCT constructs on adult exercise adherence (Hallam & Petosa, 1998). The constructs included exercise self-efficacy, self-regulation for exercise, and outcome-expectancy value for exercise. The subjects were categorized into treatment (n = 48) and comparison groups (n = 38). The intervention was focused on the self-regulation strategies and included the following subscales: 1) reinforcement; 2) social support; 3) goal-setting; 4) self-monitoring; 5) time-management; and 6) relapse prevention. The treatment group attended a four-session intervention, of which each session lasted for one hour. Pre and post results suggested that
self-regulation skills and outcome-expectancy value improved but not the self-efficacy for the treatment group. Nevertheless, small decreases in all selected variables were found in the two groups.

The Health Promotion Model was applied to develop a worksite intervention program for the workers to increase consistent use of hearing devices (Lusk, Kerr, Ronis, & Eakin, 1999). A total of 356 workers were asked to complete a questionnaire. The results were translated into an intervention program. A videotape based on the predictors of use of hearing protection was developed. Based on Bandura’s SCT, the intervention included the following: professional discussion, peer confirmation, social modelling of positive attitudes and perceptions, and written handouts. The participants were randomly assigned to a Solomon Four-Group design. Group 1 received pre-test only, group 2 received the pre-test and the intervention, group 3 received only the intervention, and group 4 received the post-test. Feedback was used to improve the intervention. Linear regression and Pearson’s correlation results showed that self-efficacy was one of the five significant predictors of hearing protection devices.

Besides research studies, there have also been reviews of literature on different intervention approaches:

The impact of behaviour management intervention on exercise adherence
was examined in a study (Robison & Rogers, 1995). Five published studies were listed to address the following questions: 1) What is the effect of the intervention on exercise behaviours, health signs and symptoms? 2) What are the characteristics of an effective intervention? Intervention techniques included the followings: stimulus control, contingency contracting, social support, self-monitoring, incentives, competitions, relapse prevention, and cognitive behaviour modification. Recommendations for future studies were that: 1) the factors for prediction of exercise adherence should be identified; 2) the impact of behaviour management techniques on adherence should be noted; 3) life-long physical activity should be emphasized; and 4) the use of multiple levels (individual, organizational, environmental, and societal changes) of intervention should be focused.

A review of 27 studies on the predictive ability of SCT in exercise was conducted by Keller, Fleury, Gregor-Holt, and Thompson (1999). A significant relationship was found between self-efficacy and exercise behaviours. The sources of self-efficacy were identified as follows: 1) performance accomplishment; 2) verbal persuasion; 3) social modelling/vicarious experiences; and 4) physiological arousal. This integrative review suggested that theoretical models and constructs are essential in the design of health related intervention programs, and that SCT has a strong relationship with promotion of exercise behaviours. It posits that self-efficacy is
related to initiation and maintenance of exercise behaviours. There is an essential need to design interventions to maximize the development of self-efficacy.

Although many research studies supported the intervention effect in changing the exercise behaviours, some studies reported that only little or no change was observed after the intervention.

In a literature review on interventions conducted by Pender (1998), it was found that SCT (Bandura, 1986) provided the theoretical basis for most of the studies aimed at helping children and adolescents to adopt life-long physical activity. However, specifications of how theory concepts were operationalised in the interventions were unclear. Among the seven physical activity intervention studies reviewed, six showed increases in physical activity and one reported no intervention effect.

Calfas et al. (2000); Sallis, Calfas, Alcaraz, Gehrman, and Johnson (1999); and Sallis et al. (1999) evaluated an intervention for the promotion of physical activity for university students. There were 338 participants at baseline and 331 participants at post-test. The intervention included using the psychosocial determinants of physical activity identified from the Transtheoretical Model and SCT. Behaviourally oriented intervention was delivered to the intervention group for 18 months. Data were collected at baseline, one and two years. Results showed that
there were no treatment effects on self-efficacy for male students.

Cardinal, Jacques, and Levy (2002) conducted a 10-week university required Lifetime Fitness for Health course (LFH) for 540 students to assess their change of leisure-time exercise behaviours. The course duration was 30 hours and delivered both in laboratory and lecture format. A quasi-experimental design was employed and the mean age of the three groups (LFH treatment group, previously enrolled in LFH group, and no LFH experience group) ranged from 19.7 to 21.5 years. Results showed that there were only insignificant changes in students’ exercise levels between pre- and post-intervention.

A Hong Kong study conducted by Chan, Shuttleworth, and Ha (2002) reported that self-efficacy could be enhanced through engagement in physical activity. The participants were 8 to 13 years of age, divided into Easy Sport Program participants (n = 793) and Non-Easy Sport Program participants (n = 1,081). They were requested to complete a 14-item questionnaire. The overall mean scores of the Easy Sport participants were higher than the Non-Easy Sport participants. This study demonstrated that through participating in physical activity, the young adults’ self-efficacy could be enhanced.
Leisure Exercise Motives and Leisure Exercise Barriers

Leisure Exercise Motives and Leisure Exercise Behaviours

The study of exercise motives and exercise behaviours has been extensive and significant (Dzewaltowski, 1989; Iso-Ahola & St. Clair, 2000; Pender, 1998; Weinberg et al., 2000). As mentioned in Chapter One, there are three types of motivation in Vallerand (1997)’s Hierarchical Models of Intrinsic and Extrinsic Motivation. Intrinsic motivation is reported to be a good predictor of exercise behaviours (Oman & McAuley, 1993; Wankel, 1993) and has positive relationship with exercise efficacy (Chase, 2001). An extrinsic motivator can only maintain exercise behaviours when it is being employed and intrinsic motivation can maintain permanently intended behaviours (Iso-Ahola & St. Clair, 2000).

Vallerand (1997) adopted the definition of intrinsic motivation as “performing an activity for itself, and the pleasure and satisfaction derived from participation” (p. 278). The diverse exercise motives can reflect participants’ expectations and values towards exercise behaviours (Tsai, 2002). According to most theorists, the primary expectations and values gained from exercise are experiences of competence and interest/enjoyment (Chen, 1998; Frederick & Morrison, 1996; Frederick, Morrison, & Manning, 1996; Frederick & Ryan, 1993; Ryan, Frederick,
Lepes, Rubio, & Sheldon, 1997; Smith, Handley, & Eldredge, 1998; Thuot, 1995). A summary of the literature review is listed below:

In a study conducted by Frederick and Ryan (1993), the relationship between motivation for sport and exercise, level of participation indices, and psychological outcomes of activity was examined. The Motivation for Physical Activities Measure (MPAM) was used to measure the participation motives for the physical activity of a group of 376 adults. A 5-point Likert scale was used in the 23-item questionnaire. Three factors were identified: competence factor (seven items), body-related factor (ten items), and interest/enjoyment factor (six items). Eigen values obtained were 5.62, 7.17, and 1.87; and the Cronbach alpha coefficients were .91, .90, and .91 for the three factors respectively. The percent of variance explained by each factor was: 24% for the competence factor, 31% for the body-related factor, and 8% for the interest/enjoyment factor. A significant correlation was only found between interest/enjoyment and competence. Results showed that there were different motivations for sport- and fitness-oriented activities. Gender was another factor that influenced the participation motives, with females found to have a higher motive for the body-related factor. The level of participation and psychological outcomes were related to feelings of physical fitness. It was shown that a focus upon external variables might not contribute to improved mental health.
One hundred undergraduate students were investigated about their attitude toward sport participation from childhood through adulthood (Thuot, 1995). The mean age of the subjects was 20.1 years. The Collegian's Attitude Toward Sport Participation Questionnaire developed by the investigator was administered in classrooms and dormitories. The five most important reasons for participating in a sport after college were: enjoyment, exercise, social aspects, staying in shape, and enjoyment of competition. Another five most important reasons cited for not participating in a sport were: loss of interest, took too much time, other activities, too competitive, and lack of ability.

The relationship between motivation to participate, exercise affect, and outcome behaviours toward physical activity was assessed by Frederick, Morrison, and Manning (1996). The participants of this study were 118 college students (men = 38, women = 80), with the mean age being 22 years. The 32-item Motivation for Physical Activity Measure-Revised (MPAM-R) was used to examine the participation motives in sport, exercise, or physical activity. Five motives were identified: interest/enjoyment motives, skill development motives, fitness motives, enhancement of body appearance, and social motives. The first two motives reflected intrinsic motivation and the other three motives represented extrinsic motivation. Generally speaking, types of motivation and gender provided the foundation for
exercise affect, and outcome behaviours toward physical activity. For men, exercise adherence can be predicted by intrinsic or extrinsic motives. For women, intrinsic orientation toward exercise was found to be a better predictor.

The 32-item MPAM-R was used again in a study done by Frederick and Morrison (1996). The purpose of the study was to find out the relationship between social physique anxiety to exercise participation, adherence behaviours, participation motives, personality variables, and emotional attitude toward exercise. A total of 127 male and 199 female members of a University Fitness Centre were surveyed. The age range was from 17 to 48, with a mean age of 20.6 years. The participants were asked to rate using a 5-point scale (1 - not at all true for me to 5 - very true for me) on the MPAM-R. Factors of the scale were the same as the previous study. Results showed that subjects with higher scores in Social Physique Anxiety reported higher extrinsic motivation.

The MPAM and the MPAM-R were employed to study the relationship between intrinsic motivation and exercise adherence (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Two studies were carried out.

In study 1, participants were 40 university students joining two voluntary, non-credit classes, Aerobics and Tae Kwon Do. Their age ranged from 18 to 24 years, with a mean age of 21. They were asked to rate on the 7-point Likert scale of
the 23-item MPAM. Three factors were analysed: 10-item body-related factor; 7-item competence factor; and a 6-item enjoyment factor. Results suggested that competence and enjoyment factors were better predictors of adherence and attendance to the chosen activity. Tae Kwon Do participants were more highly related with the competence and enjoyment motives than Aerobics participants. In study 2, the MPAM-R was used to examine a group of university fitness centre registrants. 30 items were selected for the revised questionnaire with five factors for motivation: enjoyment (7 items), competence (7 items), appearance (6 items), fitness (5 items), and social (5 items). The five factors accounted for 66% of the variance. The alphas were .92, .91, .88, .78, and .83 respectively. The findings revealed a significant gender effect with females more focused on appearance and fitness factors.

Chen (1998) developed the Motives for Activity Participation Questionnaire to examine the participation motives in physical activities and exercise between 289 Chinese students and 180 American students. There are two sections in the questionnaire: 1) subjects' current level of participation; and 2) a questionnaire with 30 items, using a 5-point scale (1 — strongly disagree to 5 — strongly agree). Three factors were identified which accounted for 35% of the total variance: 1) weight/body management; 2) mental health; and 3) social interaction. The Cronbach
alphas for the three factors ranged from .73 to .77. Significant gender and nationality differences were identified in the participation motives. These differences could be associated with their perceptions about themselves.

The relationship between reasons for exercise, frequency of exercise, and body-image satisfaction was investigated by Smith, Handley, and Eldredge (1998). The subjects were 78 male and 100 female undergraduates with age ranged from 18 to 25 years (mean = 21.2, SD = 1.9). The Reasons for Exercise Inventory, a 7-point Likert scale was employed. Four factors were identified for the inventory: fitness/health management, appearance/weight management, stress/mood management, and socializing. Results showed gender differences in the reasons for exercise, with women expressed their concerns over weight and appearance more than men.

**Leisure Exercise Barriers and Leisure Exercise Behaviours**

Perceived exercise barriers are influenced by the interaction of internal factors with perceptions of the situation wherein the behaviour will be performed (Bandura, 1986). They are considered to be one component of the interpreted environment that influences decisions about LEBE.

The Constraints Model (Crawford & Godbey, 1987) was designed for
general leisure participation. Using this Model, the perceived barriers to exercise have been classified into three categories — interpersonal, intrapersonal, and structural. Interpersonal barriers result from either interpersonal interaction or within an individual's characteristics (e.g. the sex role attitudes of marriage partners, the parent-child relationship within the family system, and interpersonal relations in general). Intrapersonal barriers result from the interaction of an individual's psychological states and attributes with leisure preferences (e.g. stress, depression, anxiety, and perceived self-skill). Structural barriers include leisure preferences and participation factors (e.g. financial resources, season, climate, and the scheduling of work time).

Crawford, Jackson, and Godbey (1991) further modified the models into a Hierarchical Model of Leisure Constraints. Three propositions were derived from this model: 1) leisure participation is heavily dependent on a process of negotiating through an alignment of multiple factors, arranged sequentially; 2) the sequential ordering of constraints represents a hierarchy of importance; and 3) social class may have a more powerful influence on leisure participation and non-participation than is currently accepted, that is, the experience of constraints is related to a hierarchy of social privilege.

Based on the above work, Raymore, Godbey, Crawford, and Eye (1993)
developed a new instrument to measure perceptions of intrapersonal, interpersonal, and structural barriers. The participants were 363 grade 12 high school students. Their mean age was 17.4 years. They were asked to respond to 21 statements (7 from each barrier). The score of each statement ranged from 1 to 4. The total score could then range from 7 to 28, with 7 representing no perceived barrier and 28 the highest level of a perceived barrier. A confirmatory factor analysis was performed for the factors. The results provided empirical support for Crawford, Jackson, and Godbey (1991)'s Hierarchical Model of Leisure Constraints. The study suggested identifying more barriers on the three categories so that a more valid leisure barrier instrument could be provided.

A previous study showed support for the Hierarchical Model of Leisure Constraint. In a study conducted by Alexandris and Carroll (1997), a total of 153 adults responded to the questionnaire. They were categorized into: no participation, participation less than once a month, participation at least once a month, and participation at least once a week. In the second part of the questionnaire, the no-participation group was asked to state the reasons for their non-participation. A 4-point Likert scale was engaged, ranging from 4 (very important) to 1 (not important). Three items were deleted from the original 32 items. A principal component analysis was carried out and seven factors were identified, accounting for
61% of the variance. The seven items were then classified into the three types of barriers under the model. The Cronbach's alpha coefficients ranged from .59 to .81 and the internal consistency reliability was .85. The findings provided empirical support for the “hierarchy of importance” proposition of Crawford, Jackson, and Godbey's Hierarchical Model of Leisure Constraints (1991). That is, barrier levels are from most proximal (intrapersonal) to most distal (structural).

A literature review showed that there are studies linking perceived exercise barriers with exercise efficacy to examine their role in the prediction of exercise behaviours.

The role of the perceived exercise barriers and exercise efficacy in exercise behaviours was examined in a community sample of adults over a 24-month period (Sallis, Hovell, Hofstetter, & Barrington, 1992). The final sample size was 1,739, constituting 86% of respondents at baseline. Out of the 21 selected variables, self-efficacy was the only significant predictor at the baseline. Both exercise efficacy and exercise barriers were significantly associated with exercise change over 24 months.

The role of self-efficacy and perceived exercise barriers in predicting exercise behaviours was confirmed by Trost, Pate, Saunders, Ward, Dowda, and Felton (1997). The participants of this study were 229 fifth-grade students. A
prospective study design was used to assess the predictors of moderate and vigorous physical activity. The dependent variables were classified as demographic, psychosocial, or environmental determinants of physical activity. Results showed that there was a significant relationship between self-efficacy and overcoming perceived barriers among elementary school children.

The role of exercise efficacy and perceived exercise barriers in predicting exercise behaviours was also examined in a group of older adults (Conn, 1998). This study used path analysis to test a developed model of exercise among 147 older adults (65 to 100 years of age). Data were collected by personal interview. The findings suggested that exercise efficacy and perceived exercise barriers were influential constructs in the prediction of exercise behaviours.

**Findings from Review of Literature**

In this chapter, a review of the relevant literature has provided evidence for the research questions and research objectives for this study. Research on self-efficacy, intervention, exercise motives, and exercise barriers on exercise behaviours provides the framework for this study. To the investigator’s knowledge, there have been no studies conducted on Hong Kong university students’ LEBE. The innovative ideas for this study are framed as follows:
1) Self-efficacy has been found to be the strongest predictor in exercise behaviours, and the inclusion of self-efficacy in studying university students’ LEBE warrants greater attention.

2) The importance of the LEM and LEB is not adequately explored in university students’ exercise behaviours. An association of these two variables with LEE helps to understand the phenomenon better.

3) It is important that the measuring instruments that are to be used possess sound psychometric properties. If there are no valid and reliable instruments suitable for the study, a new one must be developed to facilitate the measurement. Since no suitable scales were found, tailor-made scales for LEE and LEB must be developed and validated for this study.

4) If established instruments are to be used for the study, they must be validated to determine their applicability to the study population. The selected instrument must possess favourable psychometric requirements necessary for this study.

5) LEBE should be measured to quantify the leisure exercise level of university students.

6) An intervention is important to measure any change of university students’ exercise behaviours. Leisure exercise behaviour intervention must be designed around particular theories or models. In addition, the proposed mediating
variables for LEBE must be measured to clarify the effect of the intervention. A specific intervention based on Bandura’s self-efficacy theory (1997) is needed if university student’s LEBE is to be better understood.
CHAPTER 3

METHODOLOGY

Chapter 3 describes the methodology for this study. It consists of seven major areas: 1) overview of the research plan; 2) description of participants; 3) measuring instruments; 4) intervention; 5) data collection; 6) pre-analysis data screening; and 7) data analysis.

Overview of the Research Plan

The study was divided into three phases. The objective of Phase I was to assess the content (face) validity of the Leisure Exercise Efficacy Scale (LEES). Phase II focused on the investigation of the internal consistency, factorial structure, and construct validity of the LEES. Phase III was the main study, and had three objectives: 1) to examine the theoretical relationships among the variables of “LEE”, “LEM”, “LEB”, and “LEBE” of university students using SCT as a framework; 2) to assess the effect of a Required Physical Education Program (RPEP), with interventions based on Bandura’s self-efficacy theory, on the LEBE of university students; and 3) to examine the role that the Hong Kong environment plays and to identify possible ways to increase university students’ participation in
leisure exercise.

Description of Participants

Phase I

The participants for Phase I were 157 undergraduate students (male = 55, female = 102) at a Hong Kong university. They were first, second, and third year students that attended their required physical education classes. Students came normally from different degree programmes and they were recruited by their respective instructors during the physical education classes. All students participated voluntarily for this study and signed the consent forms prior to data collection (Appendix A). The study was also approved by the appropriate University Committee on Safety and Ethics.

Phase II

The participants in this phase were 240 undergraduate students in Hong Kong, of which 103 were males and 137 were females. Their ages ranged from 18 to 31 years. As in Phase I, the participants came from different Departments at the University. Prior to data collection, the investigator briefed the participants on the purpose of the study and obtained signed consent forms from them (Appendix A).
Approval was also sought from the University Committee on Safety and Ethics prior to data collection.

**Phase III**

Overall, a total of 331 first, second, and third year undergraduate students (male = 137, female = 194) volunteered to participate in this study. They were selected from one of Hong Kong’s urban universities with approximately 5,000 students. Those who enrolled in a conditioning and fitness program in the first semester of that academic year were classified as the physical education group (PEG) (110 students, male = 58, female = 52). For those who did not have physical education classes in the same semester, they were classified as non-physical education group (NPEG) (221 students, male = 79, female = 142).

Prior to data collection, the investigator secured signed consent forms (Appendix A) from the participants as required by the University Committee on Safety and Ethics. As the study collected data on two occasions and lasted for three months, some participants dropped out of the study. After preliminary data screening, only 93 participants (male = 50, female = 43) (mean age = 19.38, SD = .98) remained in the PEG while 147 participants (male = 53, female = 94) (mean age = 19.54, SD = 1.77) remained in the NPEG. The number of participants constituted 72.5% of the original sample.
Measuring Instruments

This study employed four measuring instruments. Two of them were developed by the investigator for this study:

1. Leisure Exercise Efficacy Scale (LEES) (Appendix B).
2. Leisure Exercise Barrier Questionnaire (LEBQ) (Appendix C).

The other two instruments used in the study were established questionnaires with favourable psychometric properties:

2. Leisure-Time Exercise Questionnaire (LTEQ) (Godin & Shephard, 1985) (Appendix E).

Leisure Exercise Efficacy Scale (LEES) (Ng, Cuddihy, & Fung, 2003a)

Bandura (1997) posited that self-efficacy measures must be situation specific and not be generalised, therefore it was necessary to develop LEES to conceptualize the LEE of university students. The 9-item LEES assessed the university students’ level of confidence to maintain an exercise program during their leisure-time for three months under nine adverse situations. The content of LEES was designed according to the suggestion by Bandura (1997). Response to each item
is on an 11-point scale, ranging from 0 to 100 with a 10-unit interval. The possible maximum score of this scale is 900. A higher score represents a stronger sense of exercise efficacy. The Leisure Exercise Efficacy Score is the sum of all item responses — the additive score. Details of the development and validation of the LEES are reported in Chapter 4.

*Leisure Exercise Barrier Questionnaire (LEBQ) (Ng, Cuddihy, & Fung, 2003b)*

The LEBQ was developed for this study to assess the perceived LEB of the participants. It was based on the questionnaire developed by Raymore, Godbey, Crawford, and Eye (1993). The participants’ responses ranged from “Not at all true for me” (1) to “Very true for me” (7). After exploratory factor analysis, the final version of the questionnaire consisted of 19 items with four main factors (Social & Transport, Personal-excuses, Isolation, Personal Insecurity). The factors accounted for 61.24% of the variance explained. For the present study, because of the insufficient number students that used the subscales in the path analysis model, only the sum of the LEBQ responses was used for data analysis. The possible maximum score of the LEBQ is 133 and a high score represents perceived barriers to leisure exercise to be higher. Details are reported in Chapter 5.
**Motivation for Physical Activities Measure-Revised (MPAM-R)**

The MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) was used to measure the university students’ leisure exercise motives. It contains 30 items and is scored on a 7-point scale ranging from 1 (low) through 7 (high). Five factors were reported from the original source: enjoyment, appearance, social, fitness, and competence. The factors accounted for 66% of the variance and the Cronbach alphas ranged from .78 to .92. For the present study, because of the insufficient number of students to use the subscales in the path analysis model, only the additive score of the scale was used to measure leisure exercise motives as a whole.

**Leisure-Time Exercise Questionnaire (LTEQ)**

The LTEQ (Godin & Shephard, 1985) was employed to assess the participants’ leisure-time exercise behaviours using two simple questions. The first question aims to examine the respondents’ weekly energy expenditure in leisure exercise. The formula used for calculating the energy expenditure is: $[9 \text{ METS} \times \text{number of strenuous exercise (hot and sweat inducing activity which causes a rapid heart beat) sessions}] + [5 \text{ METS} \times \text{number of moderate exercise (not exhausting) sessions}] + [3 \text{ METS} \times \text{number of light exercise (minimal effort) sessions}]$. The second question explores the frequency of sweat-inducing exercise (rapid heart beat)
sessions. From the primary source of information, the total test-retest reliability was reported to be .74 (p < .05) (Godin & Shephard, 1985) and the total correlation coefficients obtained from past studies (Sallis, Buono, Roby, Micale, & Nelson, 1993; Jacobs, Ainsworth, Hartman, & Leon, 1993) were also significant (.81 and .62 respectively, p < .05).

**Leisure Exercise Efficacy Intervention (LEEI)**

The LEEI was based on Bandura’s self-efficacy theory (1997), which was developed within the framework of SCT (Bandura, 1986). The whole RPEP lasted for three months, but because of other course requirements (e.g. skill assessment, fitness testing), the intervention could only last for 10 weeks. The intervention incorporated elements that were expected to increase students’ LEE into the normal RPEP. It was basically designed to promote adoption and maintenance of leisure exercise and to encourage change in the mediating variables, which included LEE, LEM, and LEB. The content of the LEEI included: performance enhancement (performance attainments), verbal/social persuasion (try to persuade people that they possess capabilities to achieve their goal), social modelling/vicarious experiences (observing others’ successful performances), and physiological arousal (people judge their capabilities from their own physiological condition).
Performance Enhancement

In order to develop self-efficacy through raising personal accomplishments, it is first necessary to identify some of the means that may contribute to performance enhancement. A literature review in the area of performance enhancement suggested that time dedicated to practice has a direct relationship to performance enhancement (Gould, Hodge, Peterson, & Giannini, 1989). Therefore, to help participants create more time for exercise, strategies on time management (Lottes & Garman, 1999) are an important element to be included in the intervention programme.

Goal setting has long been used by coaches and sport psychologists to help athletes stay focussed. The use of goal setting and in particular, use of tangible sub-goals to help athletes raise their performance standards was recommended (Harris & Harris, 1984). Likewise, this technique could be applied to encourage participants to focus on achieving small gains so as to enjoy a sense of success. Duda (1994) posited goal setting to be a social-cognitive approach to the study of achievement motivation in sport. Therefore, it is important for a self-efficacy intervention programme to have a component that teaches individuals the purposes and the know-how of setting realistic goals. The participants were asked to set goals and keep a weekly log to monitor their progress.

Perceived benefits and barriers to exercise have been identified as two
independent constructs and are useful in tailoring the intervention (Myers & Roth, 1997). As part of the intervention programme, participants were asked to identify their perceived benefits and barriers to exercise. Through group discussions, the benefits of exercise were stressed and means to overcome barriers were explored.

**Verbal/Social Persuasion**

Positive and encouraging feedbacks from the teacher and peers have an important impact on the self-efficacy of athletes (Weinberg, Grove, & Jackson, 1992). Bandura (1997) stated that realistic social persuasion could contribute to successful performance. Participants can be motivated to persevere in the given task if they are verbally persuaded. Along with this line, augmented feedback was provided by the teacher during the intervention period. Also, participants were grouped into two to three to provide assistance and encouragement to one another.

**Social Modelling/Vicarious Experiences**

Perceived self-efficacy can be raised by viewing other similar people’s successful performance (Bandura, 1997). Past research supported the use of social modelling as an effective intervention (Lusk, Kerr, Ronis, & Eakin, 1999). One of the common techniques used is to show the participants videotapes of successful
performances to motivate their participation. The intervention technique has been included this technique in the course content.

**Physiological Arousal**

Exercisers need to be familiarized with their physiological responses so that they can judge their capabilities to exercise (Bandura, 1997). Heart rate response is an important index of cardiorespiratory fitness (Noland, 1989), therefore participants were taught the principle of target heart rate and exercise. Handouts were provided to the participants about the information of physiological responses, emotional states, and safety precautions during exercise. High arousal tends to debilitate performance, therefore, Jacobson’s progressive relaxation technique (Cox, 1998) was taught to the participants for stress management.

The course outline and intervention for the treatment group are shown in Table 6.2 of Chapter 6.
Data Collection

Phase I

Phase I participants were asked to respond to the LEES during physical education classes on two occasions for the purpose of assessing the test-retest reliability of LEES. The interval between the two data collection periods was one week. Data were collected by the same investigator on both occasions.

Phase II

Phase II participants were asked to respond to three scales: the LEES (Ng, Cuddihy, & Fung, 2003a), the MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997), and the LTEQ (Godin & Shephard, 1985) at the beginning of semester one. Three months after the initial data collection (end of semester one), the participants were asked to respond to the three scales again.

Phase III

Both qualitative and quantitative data were collected in Phase III. Quantitative data were collected on two occasions, prior to and following the first semester of that academic year. Those who enrolled in the RPEP were the treatment group and classified as the PEG, whereas those who did not enrol in any RPEP were
classified as the NPEG. The treatment group received a LEEI whereas the control
group received no intervention at all. Participants in both groups were assessed on
two occasions (baseline and post-intervention) on the LEES (Ng, Cuddihy, & Fung,
2003a), LEBQ (Ng, Cuddihy, & Fung, 2003b), MPAM-R (Ryan, Frederick, Lepes,
Rubio, & Sheldon, 1997), and LTEQ (Godin & Shephard, 1985). The quantitative
data collected in this phase were used in both Chapters 5 and 6. In order to identify
ways to increase university students’ participation in leisure exercise, one-on-one
semi-structured interviews were conducted. Ten respondents (male = 5, female = 5)
were randomly selected from the treatment group after the intervention to attend a
semi-structured interview. Each interview lasted for about 30 minutes and provided
qualitative data for the study.

Pre-analysis Data Screening

Prior to the main data analysis, pre-analysis data screening was conducted:
1) to screen and identify the incomplete and non-bona-fide responses from the
questionnaires; 2) to compute the descriptive statistics by the SPSS 11.0 for
Windows to ensure the data were within plausible ranges; 3) SPSS Expectation
Maximization (EM) method (it uses all the information available in the data file)
was used to estimate the missing values; 4) to ensure the distribution normality of
the data, the skewness, and kurtosis were checked at the conventional but conservative (.001) alpha level (Tabachnick & Fidell, 2001); and 5) to identify and remove the multivariate outliers (cases that had unusual pattern or combination of scores) the Mahalanobis’ Distance Method (it indicates the degree of deviance of cases in multivariate space) was used.

**Data Analysis**

Quantitative and qualitative research studies provide different philosophical foundations, characteristics, and techniques to explore research questions but complement each other (Gall, Borg, & Gall, 2003). Few research studies in sport and physical education fields use qualitative research method (Gerdes & Conn, 2001). The present study required both quantitative and qualitative data analyses. Quantitative data provided basic research evidence for this study. Qualitative data helped refine our understanding on the ways for promoting leisure exercise behaviours. The SPSS version 11.0 for windows was used for quantitative data analysis. A level of significance of $p < .05$ was adopted for most statistical testings except where indicated. For qualitative data, Microsoft Word 2000 was used to type the transcriptions, and Microsoft Excel 2000 was used to organise the data to facilitate content analysis.
Phase I — Quantitative Data Analysis

The test-retest reliability of LEES was computed to provide evidence of scale stability (see Chapter 4).

Phase II — Quantitative Data Analysis

To assess the internal consistency, factorial structure, and construct validity of LEES (see Chapter 4).

Phase III — Quantitative and Qualitative Data Analyses

Quantitative data analysis

a) The Oneway ANOVA was used to test the statistical differences between the PEG and NPEG at baseline and post 3-months on LEES, MPAM-R, LEBQ, and LTEQ (see Chapter 5).

b) The EQS 5.7 for Windows was employed for the evaluation of the hypothesized models and estimation of path coefficient values to quantify the effect of LEE, LEM, and LEB on LEBE. The Maximum Likelihood (ML) method was used to compute a number of the goodness-of-fit measures to determine if the hypothesized model fitted the data. Chi-square test statistics ($\chi^2$) was used to assess the absolute fit between the hypothesized model and the data. Other fit indices used
to help evaluate the model fit included comparative fit index (CFI) and root mean square error of approximation (RMSEA) (see Chapter 5).

c) A 2 x 2 x 2 (Group x Gender x Assessment Timeline) repeated measures analysis of variance was conducted to examine the intervention effect on LEE, LEM, LEB, and LEBE. The within-subject factor was the assessment timeline (baseline and post intervention). The two between-subject factors were group (treatment/control) and gender (male/female) (see Chapter 6). MANOVA was not chosen as in line with Tabachnick & Fidell (2001)’s statement:

MANOVA is also wasteful if dependent variables are uncorrelated - naturally, or if they are factor or component scores. The multivariate test has lower power than the univariate and stepdown results. (p. 357)

Qualitative data analysis

The contents of the one-on-one semi-structured interviews were evaluated by both deductive and inductive analyses (see Chapter 6).

The deductive process employed a provisional coding list which was developed according to the theoretical framework of the study. The definitions for the codes were written to focus on the conceptual structure. The inductive process began with the mapping of the concepts into different themes. The themes were then
compared and contrasted to form the lower-order and higher-order themes. The theme development process ended with general dimensions when no more common clusters were found.
CHAPTER 4

PUBLISHED PAPER ONE

Part of the content in this chapter was published in the following peer-reviewed journal:

Contribution of individual authors on the published paper:

**Judy K. Ng**

Research design, data collection, data analysis and manuscript writing.

**Tom Cuddihy**

Supervised Judy K. Ng on the research design, data collection, data analysis and commented on the written manuscript.

**Lena Fung**

Advised Judy K. Ng on the research design, data collection, data analysis and commented on the written manuscript.
ABSTRACT

The purpose of this article was to develop a Leisure Exercise Efficacy Scale (LEES) for Hong Kong university students. Data were collected in two phases. In Phase I, (n = 157 undergraduate students), the content (face) validity was examined. Test and re-test correlation coefficients (reliability) were all shown to be positive and significant. In Phase II, (n = 240 undergraduate students), the reliability and validity were assessed. The standardized alpha of all items (α = .92) and the intraclass correlation coefficient (R = .92*) (95% CI = .90 to .93) provided support for the internal consistency. Exploratory factor analysis showed that the LEES consisted of two subscales: Time/Energy (TIE) and Intrapersonal (PER) that accounted for 72.75% of variance explained. The Construct validity was investigated by: 1) correlating the LEES with the Motivation for Physical Activities Measure-Revised (MPAM-R) (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). The correlation was positive and significant (r = .52). 2) computing the correlations between LEES and the post 3-month LTEQ. The results indicated significant correlations between the LEES subscales and the post 3-month LTEQ (r = .26 for TIE; r = .22 for PER). 3) using the univariate analysis of variance to examine the main effects for the exercise groups and sweat-inducing participants on LEES subscales. Significant main effects for the three exercise groups [F (2, 233) = 12.26 for TIE; F (2, 233) = 9.95 for PER]
and sweat-inducing participants \( F(2, 235) = 18.29 \) for TIE; \( F(2, 235) = 12.46 \) for PER] were found in both LEES subscales. This study provides evidence for the reliability and validity for the LEES. Future researchers could employ the LEES to assess leisure exercise efficacy within a university student community for the purpose of designing effective interventions to increase participation in leisure-time exercise. From a macroscopic point of view, the results obtained from the LEES could also be used for cross-cultural comparison.
Introduction

Bandura’s self-efficacy theory (1997) suggests that behaviour (e.g. one’s beliefs, goals, expectations), internal personal factors (e.g. cognitive, affective and biological factors), and the environment (e.g. people’s behaviour may be influenced by the external environment to which they are exposed) interact and influence each other. Several studies have examined the role of efficacy belief in initiating and maintaining a regular physical exercise program (Dzewaltowski, 1989; Garcia, Broda, Frenn, Coviak, Pender, & Ronis, 1995; Maddux, 1993; Yordy & Lent, 1993). Most of these studies supported the notion that self-efficacy belief is a good predictor of people’s actual exercise behaviours.

Regular exercise has been found to be associated with a decrease in health risk factors (Blair & Connelly, 1996). Increasing leisure-time exercise is one of the important goals of developed countries (Steptoe et al., 1997), and patterns of regular leisure exercise often stem from a self-belief that it is possible to include exercise in a busy lifestyle.

Numerous studies have been conducted in order to develop questionnaires for assessing self-efficacy (Dzewaltowski, 1989; Courneya & McAuley, 1994; Duncan & Stoolmiller, 1993; Labbe & Welsh, 1993; McAuley, Lox, & Duncan, 1993; Sallis, Pinski, Grossman, Patterson, & Nader, 1988). All of these questionnaires have
used subjects from Western culture. It is important to consider the cultural context when one is examining the LEBE (Tsai, 2002). Bandura (1997) stated that the scale used to measure self-efficacy must be specific to the context to achieve the target behaviour. Fu (1993) has reported that Chinese were not active in participating in leisure exercise due to the lack of a sport culture.

One important aim of university physical education programs (Avery & Lumpkin, 1987; Slava, Laurie, & Corbin, 1984; Soudan & Everett, 1981) is to encourage life-long habitual exercise in the program graduates. Thus, the university plays an important role in advocating the importance of leisure exercise to the students and encouraging active lifestyles. In Hong Kong, several universities offer required physical education programs for undergraduate students. However, the relationship between LEE and the exercise behaviour of university students is not known. A specific scale to measure LEE of university students is therefore seen to be useful. The information collected through using such a specific scale could be viewed as providing valuable clues for understanding of the university students’ LEBE. The purpose of this paper was to report on the development and validation of a questionnaire to assess the LEE of university students. This questionnaire is termed the Leisure Exercise Efficacy Scale (LEES).
Phase I

The purpose of Phase I was to assess the content (face) validity of the LEES.

Method

Item development and selection

Bandura’s (1997) self-efficacy theory provided the theoretical foundations for the development of the LEES. The purpose of the LEES is to assess the university students’ level of confidence to self-schedule and adhere to a leisure exercise regime of more than 15 minutes per week for three months under various adverse situations. While 15 minutes of regular leisure exercise is quite minimal, it was based on several contextual factors. Hong Kong university students are generally sedentary. Thirty-four percent people with post-secondary education do not participate in leisure exercise (Hong Kong Sports Development Board, 2001b). This may be due in part to the phenomenon of Hong Kong students placing too much emphasis on academic performance and claiming that this leaves them little time to participate in leisure exercise (Lindner & Sit, 1998). It is these students, the non-participators, who are of greatest concern in terms of the health benefits of exercise; therefore, the criterion was set at a potentially achievable level for non-exercisers (Tsai, 2002). It has been recommended that, for those people who do
not have 30 minutes daily to exercise, a shorter exercise regime is always better than none (National Centre for Chronic Disease Prevention and Health Promotion, 1999). Clearly, it would be a goal to advance beyond 15 minutes of leisure exercise weekly, and this amount is intended only as a starting point.

Based on questionnaires previously used in studies related to exercise efficacy (Dzewaltowski, 1989; Courneya & McAuley, 1994; Duncan & Stoolmiller, 1993; Labbe & Welsh, 1993; McAuley, Lox, & Duncan, 1993; Sallis, Pinski, Grossman, Patterson, & Nader, 1988), the investigators generated ten items which formed the initial item pool. The items were sent to three experts in the physical education and sports psychology fields to comment on the content (face) suitability of the items and the clarity of the sentence structure. Upon their recommendations, nine items were retained (see Appendix B). The response to each item was on an 11-point scale, ranging from 0 to 100, with a 10-unit interval. The choice of this response format has been suggested by Bandura (1997). The Leisure Exercise Efficacy Score was the sum of all item responses — the additive score. For LEES, the possible maximum score is 900, and the higher the score, the stronger the sense of self-efficacy.
**Participants and Procedures**

The participants for Phase I were 157 university undergraduate students (male = 55, female = 102) in Hong Kong. They were mainly first year students attending required physical education classes which focused on strength and conditioning, dance, and team sports. Physical education is a requirement in some universities in Hong Kong. Students came from different courses of study and were invited to participate in this study through their respective physical education instructors during the physical education classes. All students participated voluntarily in the study, and informed consents were obtained. Approval to conduct the study was received from the appropriate university authorities. One of the university entrance requirements in Hong Kong stipulates the requirement for a pass in English. As the LEES is written in simple English only, all participants in this study should have adequate English proficiency to understand the content of LEES. Participants were asked to respond to the LEES during physical education classes on two occasions for the purpose of assessing the test-retest reliability. The interval between the two data collection periods was one week. The same investigator collected data on both occasions, and all data collected were analysed by SPSS version 11.0 for Windows.
**Results**

Test-retest reliability was calculated, and these coefficients represent the correlations between responses of the same participant on the two administrations of the LEES. The correlation coefficients obtained between time 1 and time 2 for each item were: $r = .74^*, .74^*, .72^*, .68^*, .64^*, .65^*, .68^*, .66^*$, and $69^* (p < .005$ after Bonferroni adjustment) respectively. The coefficients were of moderate magnitude, and were all positive and significant.

The Cronbach alpha for the test-retest was reported to be .96. When using the “item deleted” method, all item alphas appeared to be .96. Separate Cronbach alphas for time 1 and time 2 were found to be .90 and .95 respectively. The relative high alphas provided evidence that the test-retest reliability of LEES was good.

**Phase II**

This phase focused on the investigation of the internal consistency, factorial structure, and construct validity of the LEES.

**Method**

**Participants and Procedures**

Participants were 240 undergraduate students in Hong Kong (male = 103,
female = 137). Their ages ranged from 18 to 31 years (M = 19.46 years, SD = 1.44).

The participants came from different courses of study; 93 of them were recruited during conditioning and fitness classes and 147 of them were recruited through the campus e-mail. Prior to the data collection, they were briefed by the investigator on the purpose of the study and informed consents were obtained. The participants were asked to respond to three scales: the LEES, the MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997), and the LTEQ (Godin & Shephard, 1985). Three months after the initial data collection the participants were asked to respond to the three scales a second time.

The MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) and the LTEQ (Godin & Shephard, 1985) were chosen because they are valid measures of exercise behaviours. From the original source, the factors accounted for 66% of the variance and the Cronbach alphas ranged from .78 to .92. The MPAM-R contains 30 items and is scored on a 7-point scale ranging from 1 (low) through 7 (high). This instrument identifies five factors relating to motivation for physical activity: enjoyment, appearance, social, fitness, and competence. The Cronbach alphas obtained from this study were .93, .85, .84, .84, and .93 respectively. The score used in this study was the additive value of the scale.

The LTEQ (Godin & Shephard, 1985) examined the participants’
leisure-time exercise patterns with two simple questions. The first question aimed to estimate the respondents’ weekly energy expenditure in leisure pursuits. The formula used for calculating this estimation was: \[ 9 \text{ METS} \times \text{number of strenuous exercise (hot and sweat inducing activity which causes a rapid heart beat) sessions} + 5 \text{ METS} \times \text{number of moderate exercise (not exhausting) sessions} + 3 \text{ METS} \times \text{number of light exercise (minimal effort) sessions}. \] The second question explored the frequency of sweat inducing exercise (rapid heart beat) sessions. The total test-retest reliability was .74 (Godin & Shephard, 1985). The test-retest coefficients obtained from other studies (Sallis, Buono, Roby, Micale, & Nelson, 1993; Jacobs, Ainsworth, Hartman, & Leon, 1993) were also significant (.81 and .62 respectively).

Data from the comparison of the LEES and the additional two instruments were analysed by SPSS version 11.0 for Windows.

Results

To validate the content appropriate for the LEES, the internal consistency, factorial structure, and construct validity were determined.

Descriptive Statistics

Descriptive statistics for the LEES are presented in Table 4.1. Among the
nine items, the lowest mean was found in item 4, “adhere to your exercise program even when you are physically fatigued”; and the highest mean was found in item 7, “adhere to your exercise program even when you are feeling depressed”.

Table 4.1. Descriptive Statistics for the LEES (n = 240)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>50.33</td>
<td>23.55</td>
</tr>
<tr>
<td>2.</td>
<td>43.21</td>
<td>24.46</td>
</tr>
<tr>
<td>3.</td>
<td>38.38</td>
<td>23.53</td>
</tr>
<tr>
<td>4.</td>
<td>36.63</td>
<td>22.40</td>
</tr>
<tr>
<td>5.</td>
<td>47.79</td>
<td>21.93</td>
</tr>
<tr>
<td>6.</td>
<td>45.38</td>
<td>21.23</td>
</tr>
<tr>
<td>7.</td>
<td>53.08</td>
<td>25.59</td>
</tr>
<tr>
<td>8.</td>
<td>43.88</td>
<td>24.21</td>
</tr>
<tr>
<td>9.</td>
<td>46.83</td>
<td>26.13</td>
</tr>
</tbody>
</table>

**Internal Consistency**

Inter-item correlation coefficients ranged from .30 to .78 and are summarized in Table 4.2. These represent moderate correlations, all of which were significant at p < .001 after Bonferroni adjustment. Intraclass correlations were calculated and found to be significant (R = .92, p < .05) with 95% Confidence Intervals of .90 to .93. The standardized alpha of the nine items was found to be .92.
which is considered to be high, providing evidence for the internal consistency of the LEES.

Table 4.2. Correlation Matrix for the LEES (n = 240)

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.74*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.68*</td>
<td>.78*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>.59*</td>
<td>.70*</td>
<td>.78*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>.56*</td>
<td>.55*</td>
<td>.62*</td>
<td>.62*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>.60*</td>
<td>.59*</td>
<td>.66*</td>
<td>.63*</td>
<td>.71*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>.50*</td>
<td>.50*</td>
<td>.58*</td>
<td>.56*</td>
<td>.58*</td>
<td>.63*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>.56*</td>
<td>.50*</td>
<td>.51*</td>
<td>.51*</td>
<td>.60*</td>
<td>.59*</td>
<td>.64*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>.34*</td>
<td>.30*</td>
<td>.30*</td>
<td>.32*</td>
<td>.47*</td>
<td>.45*</td>
<td>.48*</td>
<td>.48*</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* Significant after Bonferroni adjustment (p < .001)

**Exploratory Factor Analysis**

One of the aims for conducting exploratory factor analysis is to investigate the constructs that help explain the intercorrelations among the studied variables (Comrey & Howard, 1992). This procedure was applied to assess the factor structure of LEES. Principal components factor analysis with varimax rotation was used to determine the factors. The criterion for eigenvalue was set at greater than 1.
Criterion for retention of an item on a factor was set at .55. The result showed that the LEES has two separate factors which, together, explained 72.75% of the variance. The first factor comprised 5 items, all reflecting Time/Energy (TIE) aspects of LEE, and the second factor incorporated 4 items, representing the Intrapersonal (PER) aspect of LEE. The standardized item alphas for these two subscales in this sample were .91 and .83 respectively. Their factor loadings are presented in Table 4.3.
Table 4.3. The Leisure Exercise Efficacy Scale (LEES): Factor Loadings Generated from Exploratory Factor Analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>Loadings</th>
<th>Percent Variance</th>
<th>Cumulative Percent Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time/Energy (TIE) Subscale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program in spite of your work schedule</td>
<td>.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program after a long tiring day at the University</td>
<td>.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program even when you have excessive work demands from the University</td>
<td>.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program even when you are physically fatigued</td>
<td>.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program even when social obligations are very time consuming</td>
<td>.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>42.82</td>
<td>42.82</td>
</tr>
<tr>
<td><strong>Intrapersonal (PER) Subscale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program in spite of family responsibilities</td>
<td>.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program even when you are feeling depressed</td>
<td>.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program even when bearing minor injuries</td>
<td>.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhere to your exercise program even when exercise is boring</td>
<td>.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>29.93</td>
<td>72.75</td>
</tr>
</tbody>
</table>
Construct Validity

We rationalized that if LEES is a valid tool for measuring LEE, positive and significant correlations between LEES and MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) should be found. Construct validity was investigated by correlating the LEES with the MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). The correlation coefficient representing the relationship between the LEES and the MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) was positive and significant (r = .52, p < .01). When the MPAM-R was correlated with the LEES subscales, the significant correlation coefficients for the TIE and PER were .50 and .46 respectively (p < .01).

To further determine the construct validity of the instrument, simple correlations representing the relationships between LEES and the post 3-month LTEQ (Godin & Shephard, 1985) were computed. The post 3-month total weekly leisure energy expenditure was correlated with the LEES subscales (TIE and PER). The correlation coefficients obtained for the TIE and PER were .26 and .22 respectively, which are low but positive and significant (p < .01).

Univariate analysis of variance was conducted to give more evidence on the construct validity of the LEES. The assumption was that if LEES does assess post-3 month LEE, then individuals who score higher on the efficacy scale should be more
likely to score higher in LTEQ (Godin & Shephard, 1985) after 3 months. The results for the three exercise groups, HE, LE, and NE, are summarized in Table 4.4.

<table>
<thead>
<tr>
<th></th>
<th>Mean for High Exercisers (SD)</th>
<th>Mean for Low Exercisers (SD)</th>
<th>Mean for Non-exercisers (SD)</th>
<th>Univariate F</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIE</td>
<td>236.25 (95.21)</td>
<td>207.76 (94.74)</td>
<td>117.06 (88.58)</td>
<td>12.26*</td>
</tr>
<tr>
<td>PER</td>
<td>208.57 (74.52)</td>
<td>187.94 (75.12)</td>
<td>122.35 (89.69)</td>
<td>9.95*</td>
</tr>
</tbody>
</table>

* p < .05

Significant main effects for both of the LEES subscales were found, suggesting that the exercise pattern (HE, LE, and NE) had a significant effect on the LEE score. In both cases, the High Exercisers scored higher than the Low Exercisers who in turn scored higher than the Non-Exercisers. These results provided support for the construct validity of the LEES.

Similar univariate analysis of variance was performed for the Sweat Inducing (SI) participants. The question asks the participants to indicate their frequency of sweat-inducing exercise sessions (Often, Sometimes, Never/Rarely).
Univariate results for the differences are presented in Table 4.5.

Table 4.5. Post-3 Month LTEQ (Sweat-inducing) Participants Differences on LEES

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean for Often (SD)</th>
<th>Mean for Sometimes (SD)</th>
<th>Mean for Never/Rarely (SD)</th>
<th>Univariate F</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIE</td>
<td>262.81 (107.59)</td>
<td>227.49 (89.91)</td>
<td>154.75 (92.21)</td>
<td>18.29*</td>
</tr>
<tr>
<td>PER</td>
<td>221.56 (88.58)</td>
<td>202.28 (70.09)</td>
<td>151.48 (81.83)</td>
<td>12.46*</td>
</tr>
</tbody>
</table>

* p < .05

A significant main effect (p < .05) was found for SI on both LEES subscales. In both subscales, the participants in the “Often” category scored higher than participants in the “Sometimes” category who, in turn, scored higher than the “Never/Rarely” category. These results further support the construct validity of the LEES.
Discussion

Based upon the results of Phases I and II, the LEES shows promise as a measure of LEE for university students. It is brief and easy to administer and possesses favourable psychometric properties.

Test-retest reliability coefficients were shown to be positive and significant. From a validity perspective, Phase II data provided support for the internal consistency, factorial structure, and construct validity of the LEES.

The standardized alpha of all items was relatively high. In addition, the intraclass correlation was strong and significant. These provided evidence of internal consistency for the LEES. Exploratory factor analysis indicated a consistent and logical two-dimensional structure (TIE and PER) for the scales with 72.75% of variance explained.

The MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) was employed to establish construct validity with the LEES. Bandura (1991) posited that self-efficacy plays an important role in the self-regulation of motivation. The moderate, significant correlation between the LEES and MPAM-R suggests that LEES provides a relatively good representation of the motivation for leisure exercise as measured by the MPAM-R (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997).

The correlation coefficient results (r = .26 & .22 for TIE & PER respectively)
further provided evidence for the construct validity of LEES to predict the post 3-month total weekly leisure energy expenditure. With univariate analysis of variance used to examine the construct validity, significant main effects were found for exercise pattern and sweat-inducing exercise relative to the subscales of the LEES. The results provided more evidence on the construct validity for the scale.

The LEES has several advantages. It is: a) theoretically based; b) contextual and culture-specific; c) comprehensive, covering a wide range of mechanisms in assessing LEE; and d) comprised of only nine items for easy administration.

The present study is not, however, without limitations. When interpreting the results, one should note the lack of detailed background information about sample characteristics such as age and courses of study in Phase I. The goal of over 15 minutes per week of leisure exercise is potentially low, given the evidence for the effects of 30 minutes of accumulated physical activity daily (Blair & Connelly, 1996), thus higher amounts should be explored. In addition, the data were analysed without separating male and female participants. Furthermore, the relatively low correlations between the LEES and LTEQ (Godin & Shephard, 1985) should also be taken into account. Finally, the fact that the LEES is contextual and culture-specific may also be seen as a limitation with respect to the generalisability of the results. Future research should seek to provide additional evidence for convergent and divergent validity for
the LEES instrument.

In conclusion, this study provided supportive evidence for the reliability and validity of the Leisure Exercise Efficacy Scale in measuring Hong Kong university students’ LEE. Many researchers have devoted effort to develop a measurement scale for exercise efficacy (Dzewaltowski, 1989; McAuley, Lox, & Duncan, 1993; Marcus, Selby, Niaura, & Rossi, 1992; Marcus & Owen, 1992; Saunders et al., 1997), however, a measurement scale specifically for Hong Kong university students was not found.

Exercise science research is a rapidly expanding field in China. Consequently, the LEES would be a valuable tool for use within a Chinese university student community. Researchers may employ the LEES to assess the exercise efficacy of Chinese university students and to design interventions to increase student participation in leisure exercise. This study used Chinese university students as the sample as it was intended that the instrument used for measuring exercise efficacy should be culture and contextual-specific (Bandura, 1997). It is hoped that, as a future development, the LEES could be used for cross-cultural studies.
CHAPTER 5

PUBLISHED PAPER TWO

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Contribution of individual authors on the published paper:

**Judy K. Ng**

Research design, data collection, data analysis and manuscript writing.

**Tom Cuddihy**

Supervised Judy K. Ng on the research design, data collection, data analysis and commented on the written manuscript.

**Lena Fung**

Advised Judy K. Ng on the research design, data collection, data analysis and commented on the written manuscript.
ABSTRACT

The purpose of this article was to examine the theoretical relationships among the variables of “LEE”, “LEM”, “LEB”, and “LEBE” of university students using SCT as a framework. The Model of University Students’ Leisure Exercise Behaviours (MUSLEB) was hypothesized before data collection to investigate the theoretical relationships among the variables. Initially, a total of 331 university students were recruited for this study. Data were collected on two occasions using measuring instruments that included the LEES, the MPAM-R, the LEBQ, and the LTEQ. Participants were classified into PEG and NPEG to examine their differences in LEBE. As no significant difference was found on the LEBE between the two groups at the end of the semester, all the participants were pooled to test the hypothesized model (n = 172). The hypothesized model was found to be acceptable with $\chi^2 / df = 1.85$, CFI = .98, and RMSEA = .07. In an attempt to test a more parsimonious model, all non-significant paths were removed from the model and a re-specified MUSLEB was analysed again. The re-specified model provided evidences ($\chi^2 / df = 1.39$, CFI = .98 and RMSEA = .05) that this was tenable and more parsimonious than the hypothesized model. Path analysis results showed that LEE was a significant and direct predictor of LEBE three months after the commencement of the semester. As hypothesized, positive and significant
relationships were found between LEE and LEM. However, contrary to expectation, a positive significant effect between post 3-month LEE and post 3-month LEB was observed. The investigators suggested the evidence gave support for the theoretical model hypothesizing possible external environmental cause on this phenomenon. Limitations and recommendations for the study are discussed.
Theoretical Framework

The determinants of LEBE have often been studied. Among various psychosocial determinants, LEE was considered to be the strongest predictor of LEBE (Conn, 1998; Duncan & Stoolmiller, 1993; Rovniak, Anderson, Winett, & Stephens, 2002). The SCT (Bandura, 1986) is one of the commonly used theories for studying avoidance type of human behaviour. One of the core aspects of SCT is the self-efficacy belief which stemmed from the self-efficacy theory. The theory indicates that efficacy beliefs influence people’s courses of action, effort, and perseverance when they encounter adverse situations (Bandura, 1997). According to this theory, people with a strong sense of self-efficacy expend more effort and persist longer when facing challenging tasks than those with a weaker sense.

Part of understanding LEBE involves discerning the motives behind it. The positive causal relationship between participation motives toward leisure exercise has been well documented (Biddle, 1992; Mathes & Battista, 1985). The predictive role of exercise motive in leisure exercise was supported by Iso-Ahola & St. Clair (2000). Exercise motives are a psychological mechanism that direct exercise behaviours. In other words, the set of exercise motives is one of the determinants of LEBE.
Bandura (1977) stated that behaviour, internal personal factors, and the external environment are three major determinants of human behaviour and they interact in a triadic reciprocal causation. Human behaviour is influenced by the interaction of an individual’s internal factors and his/her perceptions about the environment where the behaviour is executed. Perceived exercise barriers effect people’s decisions concerning their LEBE. People may decline to participate in leisure exercise when they perceive a barrier. The negative relationship between LEB and LEBE was described by Conn (1998) using a path model.

Exercise self efficacy, exercise motives, and exercise barriers have been shown to be important determinants in LEBE (Wu, Ronis, Pender, & Jwo, 2002). The relationship among these variables is one of the themes in contemporary research (Oman & McAuley, 1993). They suggested that complete theoretical models should be employed to examine the relationships between predictive variables and LEBE.

To assist university students in adopting physically active lifestyles is an integral part of the mission of the university education. The university environment has been suggested to be a positive setting for the promotion of LEBE (Calfas et al., 2000; Rovniak, Anderson, Winette, & Stephens, 2002). It may be suggested that a common concern of most leisure studies and physical education university personnel is the enhancement of students’ LEBE for their health benefits. These staff are
generally interested in whether or not LEE, LEM, and LEB are related to students’ LEBE. There are eight universities in Hong Kong and only two offer a RPEP for the students. This study concerns students in one of these two universities. They are required to choose two different physical education subjects throughout their 3-year study in the university. Normally students would enrol in the RPEP in their first year of study. This study was designed to explore university students’ LEBE determinants and their inter-relationships so that appropriate physical education subjects may be designed to fit students’ needs. The main aim of this study was to examine the relative influence of the three selected psycho-social variables on university students’ LEBE immediately after the first semester of the academic year. In addition, the investigators wished to determine if there were differences on these variables between students taking or not taking the RPEP on the LEBE.

A path analysis approach was considered to be the most suitable analytical tool to help clarify the interrelationships of the proposed variables (Pedhazur, 1982) utilised in this study. Based on the literature and the theoretical framework of the SCT, the authors hypothesized a Model of University Students’ Leisure Exercise Behaviours (MUSLEB) (Figure 5.1.) before data collection to investigate the theoretical relationships among the LEE, LEM, LEB, and LEBE of university students. According to Bandura’s triadic reciprocal causation model, behaviour,
internal personal factors, and the external environment are major determinants of
human behaviour. In this model, the university environment was the external
environment, LEBE was the behaviour, and the selected variables for the internal
personal factors were LEE, LEM, and LEB. Literature review has shown that
self-efficacy is the strongest predictor of exercise behaviours (Leveille,
Cohen-Mansfield, and Guralnik, 2003), plays an important role in regulating exercise
motives (Bandura, 1991), and a significant predictor for exercise barriers (Sallis,
Hovell, Hofstetter, & Barrington, 1992). The proposed model was therefore
summarized in the following five propositions. First, the time 1(T-1) (at the
beginning of the first semester) LEE was posited to have a direct impact on T-1 LEM
and LEB. In this path model, LEBE was not included at T-1 because the focus of this
study was to examine the LEBE of the students three months after the
commencement of the new semester — end of the first semester. The LEES asked
the respondents to indicate their level of confidence to maintain an exercise program
for three months, concurrent LEE and LEBE were therefore not assessed. Second,
T-1 LEE was expected to directly influence time 2 (T-2) (3 months after the
commencement of the semester) LEE, LEM, LEB, and LEBE. Third, T-1 LEM and
T-1 LEB directly influenced T-2 LEM and T-2 LEB respectively. Fourth, T-2 LEE
was proposed to have direct influence on T-2 LEM and T-2 LEB. Finally, T-1 LEE
was postulated to influence T-2 LEE; T-1 and T-2 LEM; and T-1 and T-2 LEB on T-2 LEBE.
Start of Semester (T-1)  
End of Semester (T-2)

LEE—Leisure Exercise Efficacy  
LEM—Leisure Exercise Motives  
LEB—Leisure Exercise Barriers  
LEBE—Leisure Exercise Behaviours

* p < .05

Figure 5.1. A Hypothesized Model of University Students’ Leisure Exercise Behaviours (MUSLEB)
Method

Participants

The participants were undergraduate students from one of Hong Kong’s universities. Initially, a total of 331 students (male = 137, female = 194) volunteered to participate in this study. They were first year to final year undergraduate students, and were classified as PEG and NPEG. This classification was utilised to provide information on the effect of the university RPEP on the enhancement of LEBE. The PEG consisted of 110 students (M = 58, F = 52) enrolled in a conditioning and fitness program for the first semester and NPEG consisted of 221 students (M = 79, F = 142) with no physical education class for that semester. The conditioning and fitness program was chosen for this study because all other PE programs offered by the university were considered to be too sport-specific. As the study collected data at two points of time which were separated by 3 months, some participants dropped out from the study. After preliminary data cleaning, only 93 participants (male = 50, female = 43) (mean age = 19.38, SD = .98) remained in the PEG while 147 participants (male = 53, female = 94) (mean age = 19.54, SD = 1.77) remained in the NPEG. This constituted 72.5% of the original sample. Prior to data collection, the investigators secured informed consents from the participants and approval to conduct the study from the appropriate university committee.
Measurement Instruments

Leisure Exercise Efficacy Scale (LEES)

The selection of the LEE examined in this study was based on reported literature (Courneya & McAuley, 1994; Duncan & Stoolmiller, 1993; Dzewaltowski, 1989; Labbe & Welsh, 1993; McAuley, Lox, & Duncan, 1993; Sallis, Pinski, Grossman, Patterson, & Nader, 1988). As self-efficacy measures must be situation specific and not generalized, the investigators developed an instrument — the LEES to assess the LEE of the university students. It assesses the university students’ level of confidence to maintain an exercise program during their leisure-time for three months under nine adverse situations. Details of the development and validation of the LEES were reported elsewhere (Ng, Cuddihy, & Fung, 2003a) (Appendix B).

Motivation for Physical Activities Measure-Revised (MPAM-R) (Ryan, Frederick, Lopes, Rubio, & Sheldon, 1997)

The MPAM-R (Ryan, Frederick, Lopes, Rubio, & Sheldon, 1997) was used to assess the LEM of the participants. This scale was chosen because it was reported to be a valid tool to measure exercise motives. The participants were requested to respond to the 30 items on a 7-point scale ranging from 1(low) through 7 (high). It was reported that the original five factors accounted for 66% of the variance and the alphas ranged from .78 to .92. As the investigators were only
interested in the summative value of the MPAM-R in conducting the path analysis of the model, the individual factors were not used in this study.

**Leisure Exercise Barrier Questionnaire (LEBQ)**

Based on the questionnaire developed by Raymore, Godbey, Crawford, & Eye (1993) to assess leisure barriers, the LEBQ was developed for this study. As the original questionnaire focused only on perceptions of general leisure barriers when beginning a new leisure activity, the investigators added some items to the original questionnaire and increased the item number from 21 to 31 items. The nature of the added items was mainly intrapersonal to strengthen the scale. The items were re-phrased to suit the university situation. The content (face) validity was reviewed and approved by a panel of three experts in the physical education and sports psychology fields. According to Nunnally (1978), the reliability of a scale response increased rapidly from a low of 2 scale steps but has the tendency to level off at about 7. Therefore the investigators used the 7-point Likert-type scale response for this questionnaire. The original scale ranged from 1 to 4. As the content of the LEBQ was different from the original, it was not seen to be important to cross-validate the response similarity of the two questionnaires. Responses were indicated from “Not at all true for me” (1) to “Very true for me” (7). After exploratory factor analysis, the
final version of the questionnaire consisted of 19 items with four factors (Social & Transport, Personal-excuses, Isolation, Personal Insecurity). The factors accounted for 61.24% of the variance explained. Their factor loadings are presented in Table 5.1.
<table>
<thead>
<tr>
<th>Item</th>
<th>Loadings</th>
<th>Percent Variance</th>
<th>Cumulative Percent Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social &amp; Transport Subscale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because my friends don’t have enough money to do the exercise with me</td>
<td>.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because I don’t have transportation</td>
<td>.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because my friends have too many obligations to do the exercise with me</td>
<td>.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because the exercise is not in keeping with my religious beliefs</td>
<td>.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because my friends don’t have enough skills to do the exercise with me</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because my friends don’t have transportation to get to exercise with me</td>
<td>.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because my friends don’t know what new leisure activities would interest me</td>
<td>.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Personal-excuses Subscale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because the exercise makes me feel uncomfortable</td>
<td>.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because exercise is boring</td>
<td>.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because I’m afraid of injury</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because exercise is painful</td>
<td>.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because I feel tired or lack of energy</td>
<td>.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because I’m too lazy</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because I am not interested</td>
<td>.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Isolation Subscale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because my friends live too far away to do the exercise with me</td>
<td>.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because the facilities I need to do the activity are too crowded</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because my friends don’t have time to do the exercise with me</td>
<td>.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Personal Insecurity Subscale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because I’m too shy</td>
<td>.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because I have no self-confidence</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.1. The Leisure Exercise Barrier Questionnaire (LEBQ): Factor Loadings Generated from Exploratory Factor Analysis
The participants were asked to rate the barriers to their participation in leisure exercise. For the present study, only the sum of the LEBQ responses was used for data analysis. The possible maximum score of the LEBQ is 133 and a high score represents greater perceived barriers to leisure exercise (Appendix C).

**Leisure-Time Exercise Questionnaire (LTEQ) (Godin & Shephard, 1985)**

The LTEQ (Godin & Shephard, 1985) was considered to be a valid tool to examine the participants’ leisure-time exercise behaviours. The reliability and validity of the questionnaire were reported in many studies (Jacobs, Ainsworth, Hartman, & Leon, 1993; Miller, Freedson, & Kline, 1994; Sallis, Buono, Roby, Micale, & Nelson, 1993) and found to be good. The total test-retest reliability was reported to be .74; and significant correlations with maximum oxygen consumption and body fat were found (.24 and .13 respectively) in a previous study conducted by Godin & Shephard (1985). The LTEQ contains two simple questions. This study used the responses from only the first question. The participants were asked to indicate the number of times (sessions longer than 15 minutes) per week they exercised during their leisure-time. Their weekly energy expenditure in leisure pursuits was determined by the formula provided by Godin & Shephard (1985): (9
METS x number of strenuous exercise sessions) + (5 METS x number of moderate exercise sessions) + (3 METS x number of light exercise sessions).

**Procedures**

A two-wave, time-lagged design with two groups (PEG & NPEG) was used to test the hypothesized model. Data were collected on two occasions. PEG data were collected during normal physical education classes and NPEG data were collected in a lecture theatre. At T-1 (baseline), participants were asked to respond to the LEES (LEES-1), MPAM-R (MPAM-R-1), LEBQ (LEBQ-1), and LTEQ (LTEQ-1). During the semester, the PEG attended the conditioning and fitness program for three months while the NPEG did not have any PE classes. At T-2 (3 months after time 1 — end of first semester), data collected included responses to the LEES, MPAM-R, LEBQ, and LTEQ. To distinguish the data generated by these questionnaires at T-1, they were referred to as LEES-2, MPAM-R-2, LEBQ-2, and LTEQ-2. T1 and T2 data were matched by the participants’ identity numbers.
Data Analysis

All data were input into the computer and analysed by two statistical software packages. The SPSS 11.0 for Windows was used for preliminary data analysis. The One-Way ANOVA was used to test the statistical differences between the PEG and NPEG at baseline and post 3-months on LEES, MPAM-R, LEBQ, and LTEQ. The EQS 5.7 for Windows was employed for the evaluation of the hypothesized models and estimation of path coefficient values to quantify the effect of the LEE, LEM, and LEB on the LEBE. The Maximum Likelihood (ML) method was used to compute a number of the goodness-of-fit measures to determine if the hypothesized model fitted the data. The chi-square test statistics ($\chi^2$) was used to assess the absolute fit between the hypothesized model and the data. Other fit indices used to help evaluate the model fit included comparative fit index (CFI) and root mean square error of approximation (RMSEA). A level of significance of $p < .05$ was used to test the viability of individual paths.

Results

Preliminary Analysis

As the sample number in the PEG (n = 93, male = 50 & female = 43) and NPEG (n = 147, male = 53 & female = 94) differed, a factor which might create a
computation problem and ambiguous results for the one-way between subjects ANOVA (Tabachnick & Fidell, 2001), cases were randomly deleted from the sample until the number of PEG, NPEG, male, and female participants were equal. The total number of participants for data analysis was 172 people, with 43 each in PEG, NPEG, male, and female categories.

**Validity of the LEES**

The validity of the LEES-1 in measuring the post 3-month LEBE was considered to be important in testing the hypothesized model. From the LTEQ-2 score, the participants were classified into three groups according to their weekly leisure MET levels. The upper one third were classified as High Level (35 METs – 105 METs), the middle one third were classified as Medium Level (18 METs – 34 METs), and the lower one third was classified as Low Level (0 – 17 METs). One-way ANOVA was performed to compare the means between the three leisure exercise levels and the LEES-1. Tukey post-hoc means comparisons of scores on LEES-1 for participants in the three LTEQ-2 levels showed that there were significant differences between High Level and Low Level participants, and between Medium Level and Low Level participants. However, no significant difference was found
between High Level and Medium Level participants. The results thus provided some evidence for the sensitivity of the LEES-1.

**Internal Consistency of the Measurement Instruments**

Prior to evaluating the MUSLEB, the Cronbach’s alpha coefficients of each measurement instrument were computed to assure the scales were reliable for the sample of this study. Results revealed that the reliability coefficients for the LEES-1, MPAM-R-1, and LEBQ-1 were .92, .93, and .88 respectively. All scales were considered to be reliable with all coefficients exceeding .70 (Nunnally, 1978).

**Comparison between the PE and NPE groups**

Oneway ANOVA was performed to compare the means of all the variables for the PEG and NPEG. The ANOVA results showed that there were no statistical differences between the two groups on baseline LEES (p = .45), MPAM-R (p = .25), LEBQ (p = .38), and LTEQ (p = .45) scales.

Means and standard deviations for the LEES, MPAM-R, LEBQ, and LTEQ are presented in Table 5.2.
The Pearson correlations of the variables in the proposed model are presented in Table 5.3. Results of the correlational analysis showed that only nine out of the twenty-one correlations supported the predicted relationships. The LTEQ-2 was only positively correlated with the LEES-1 and LEES-2.
Table 5.3. Pearson Correlations of the Seven Variables in the Proposed Model (n = 172)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>LEES-1</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>LEES-2</td>
<td>.51*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>MPAM-R-1</td>
<td>.47*</td>
<td>.24*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>MPAM-R-2</td>
<td>.44*</td>
<td>.56*</td>
<td>.46*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>LEBQ-1</td>
<td>-.07</td>
<td>-.05</td>
<td>.03</td>
<td>-.07</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>LEBQ-2</td>
<td>-.08</td>
<td>.14</td>
<td>-.04</td>
<td>.02</td>
<td>.41*</td>
<td>1.00</td>
</tr>
<tr>
<td>7.</td>
<td>LTEQ-2</td>
<td>.27*</td>
<td>.34*</td>
<td>.21</td>
<td>.23</td>
<td>-.08</td>
<td>-.08</td>
</tr>
</tbody>
</table>

* Significant after Bonferroni adjustment (p < .002)
adjusted p level = .05/21 = .002

The Oneway ANOVA results indicated that there were no statistical differences between the PEG and NPEG three months after the commencement of the semester on LEBE (p = .45). This result indicated that students whether they were enrolled or not in a RPEP did not differ in their LEBE. In this case, it was meaningless to test two separate models for the PEG and NPEG. The investigators decided to pool the PE and NPE data to test the hypothesized model.
Path Analysis of the Model

The hypothesized path diagram with path coefficients and squared multiple correlations is shown in Figure 5.2.
Figure 5.2. Test of the Hypothesized Model of University Students’ Leisure Exercise Behaviours (MUSLEB) with Path Coefficients

LEE—Leisure Exercise Efficacy
LEM—Leisure Exercise Motives
LEB—Leisure Exercise Barriers
LEBE—Leisure Exercise Behaviours

* p < .05
Eight of the hypothesized paths were significant. The T-1 LEE (.47, t = 6.89, p < .05) significantly influenced T-1 LEM and accounted for 22% of the variance. The T-1 LEM (.32, t = 4.79, p < .05) and T-2 LEE (.45, t = 6.56, p < .05) significantly predicted T-2 LEM and accounted for 42% of the variance. The T-1 LEE (-.17, t = -2.18, p < .05), T-1 LEB (.41, t = 5.96, p < .05), and T-2 LEE (.25, t = 3.07, p < .05) significantly predicted T-2 LEB and accounted for 22% of the variance. The T-1 LEE was a significant predictor of T-2 LEE (.51, t = 6.81, p < .05) and accounted for 26% of the variance. The T-1 LEE was a significant predictor of the T-2 LEB (.21, t = 2.54, p < .05) and accounted for 9% of the variance.

The model fitted the data with a chi-square of 12.94 (df = 7, p = .07). The Likelihood-Ratio chi-square statistics ($\chi^2 / df$) was 1.85 and considered to be acceptable (Joreskog, 1969). The comparative fit index was .98 and the RMSEA was .07.

In an attempt to test a more parsimonious model, non-significant paths were removed from the model and the re-specified model was analysed again. The re-specified model with path coefficients and squared multiple correlations is presented in Figure 5.3.
LEE—Leisure Exercise Efficacy
LEM—Leisure Exercise Motives
LEB—Leisure Exercise Barriers
LEBE—Leisure Exercise Behaviours

* p < .05

Figure 5.3. A Re-specified Model of University Students’ Leisure Exercise Behaviours (MUSLEB)
Similar results were obtained for the path coefficients of the re-specified model. The T-1 LEE (.47, t = 6.87, p < .05) significantly influenced T-1 LEM and accounted for 22% of the variance. The T-1 LEM (.34, t = 5.62, p < .05) and T-2 LEE (.47, t = 7.83, p < .05) significantly predicted T-2 LEM and accounted for 42% of its variance. The T-1 LEE (-.17, t = -2.18, p < .05), T-1 LEB (.41, t = 5.95, p < .05), and T-2 LEE (.25, t = 3.06, p < .05) significantly predicted T-2 LEB and accounted for 22% of the variance. The T-1 LEE was a significant predictor of T-2 LEE (.51, t = 7.75, p < .05) and accounted for 26% of the variance. The T-1 LEE was a significant predictor of the T-2 LEB (.27, t = 3.70, p < .05) and accounted for 8% of its variance.

The re-specified model fitted the data with a chi-square of 18.09 (df = 13, p = .15). The Likelihood-Ratio chi-square statistics ($\chi^2 / df$) was 1.39 and considered to be acceptable (Joreskog, 1969). The comparative fit index was .98 and the RMSEA was .05. The CFI obtained from the two models were .98. According to Schumacker & Lomax (1996), values close to .90 reflect a good model fit, both the results thus represented good-fitting models. For the chi-square and the RMSEA results, the re-specified model was found to have a better fit of the data to the model. Bollen (1989) suggested that the larger the probability associated with the $\chi^2$, the better the fit of the model to the data. Using the rule of thumb that when the RMSEA of < .10
is good and < .05 is very good (Loehlin, 1998), the RMSEA of the re-specified model was better than the hypothesized model. All values of the re-specified model provided evidence that this model was tenable and more parsimonious than the hypothesized model.

Discussion

The use of longitudinal designs and the path analysis method in this study was seen to be suitable to examine the theoretical relationships of the LEE, LEM, LEB, and LEBE for the university students.

The findings of the present study are consistent with numerous other studies (Conn, 1998; Duncan & Stoolmiller, 1993; Rovniak, Anderson, Winett, & Stephens, 2002; Wallace, Buckworth, Kirby, & Sherman, 2000) on the determinants of exercise behaviours. LEE was found to have a significant and direct effect on the LEBE after the 3-month semester for the undergraduate students. The nature of the effect was that the increase of LEE led to the increase participation of LEBE. In terms of the predictive role of the LEE on LEM, significant and positive effects were found for data collected at the same point in time. However, no direct significant effect was found between baseline LEE and post 3-month LEM, only indirect effect was
observed when they were mediated by LEM-1. An expected significant negative effect was found between baseline LEE and post 3-month LEB.

Surprisingly, a positive significant effect was found between the post 3-month LEE and the post 3-month LEB. From the significant correlation between the LEES-1 and the LTEQ-2 \((r = .27, p < .05)\), we can confirm that those participants with low LEE were normally low leisure exercisers and those with high LEE were normally active leisure exercisers. Therefore the unusual phenomenon may be explained due to the fact that at Time 2 data collection with the approach of the end of semester examinations, the active students reflected their worries in focusing on their perceived LEB. The low leisure exercisers, as they only spent a little time on leisure exercise, might not have perceived the existence of the LEB even when it was near to the final examination. The result was consistent with Bandura’s (1997) suggestion that the external environment plays an important role in determining human behaviours.

While the MUSLEB may provide a useful tool to examine the predictors of LEBE for university students, the following limitations are worth noting. The first limitation was the nature of the participants. This study employed undergraduate students as participants and this greatly limited the generalization of the findings of this study. The second limitation was the lack of significant difference between the
outcomes of the PEG and NPEG at the end of the semester and the decision to pool
the two groups to test the hypothesized model. The third limitation was the 27.5%
loss of participants due to dropout, data cleaning, and the unequal numbers of PEG,
NPEG, male, and female participants. After random deletion, only 172 participants
were left for data analysis which constituted only 52% of the original sample.
Statistically, the sample size (n = 172) was acceptable for a path model with only
four variables (Cohen, 1988), an extension of this finding with a larger sample size to
assess on the individual factors of the selected variables is necessary. The fourth
limitation was the relatively small proportion of variance explained in this study. The
variables in the re-specified model explained less than 10% of the variance in LEBE
($R^2 = 8\%$). A majority of the LEBE variance remains unexplained. Based on the
amount of variance explained, the model was considered to be less effective in
developing an understanding of the university students’ LEBE. The results suggest
that other variables may be required to add to the model so as to strengthen the
explanatory power of the model. This represents a future direction for research
studies to examine the path models of university students’ LEBE.

Duncan & Stoolmiller (1993) stated that the testing of the hypothesized
model could enable the researchers to investigate the relationships among the
theoretical constructs so as to clarify the hypotheses. Despite the limitations
mentioned above, this study could be viewed as a clarification of the possible theoretical relationships between the LEE, LEM, LEB, and LEBE for Hong Kong’s university students before and after the commencement of the semester.
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Contribution of individual authors on the published paper:

Judy K. Ng
Research design, data collection, data analysis and manuscript writing.

Tom Cuddihy
Supervised Judy K. Ng on the research design, data collection, data analysis and commented on the written manuscript.

Lena Fung
Advised Judy K. Ng on the research design, data collection, data analysis and commented on the written manuscript.
ABSTRACT

This article examines the effect of a RPEP, with LEEI, on the LEBE of university students. The study also investigates the role that the environment plays and attempts to identify possible ways to increase university students’ participation in leisure exercise. Bandura’s self-efficacy theory was integrated into the RPEP as the research intervention, which lasted for 10 weeks. There were two parts to the study. Part I employed the 2 group (treatment group and control group) experimental design. A total of 86 participants (male = 43, female = 43) were in the treatment group and 86 participants (male = 43, female = 43) were in the control group. Three psychosocial mediators (LEE, LEM, and LEB) and LEBE were measured. Data were collected on two separate occasions, pre and post intervention. A 2 x 2 x 2 (Group x Gender x Assessment Timeline) repeated measures analysis of variance was conducted to examine the differences between the 2 groups (treatment group and control group) and gender on all the dependent variables at baseline and post-test. Results showed that there were no significant 3-way interaction effects (Group x Gender x Assessment Time) or 2-way interaction effects (Gender x Assessment Time) (Group x Assessment Time) for all variables. Part 2 used the qualitative methodology. Ten respondents (male = 5 & female = 5) were randomly selected from the treatment group after the intervention to attend a semi-structured interview to identify ways to
increase university students’ participation in leisure exercise. Both deductive and inductive processes were used for content analysis. Three LEB were perceived by the respondents: 1) time; 2) attitudes towards exercise; and 3) structural. From the twenty-five lower order themes, three general dimensions emerged: 1) reinforcement of LEE; 2) enhancement of LEM; and 3) encouragement of a university sports culture. The limitations of the study and practical suggestions to enhance university students’ LEBE are discussed.
Introduction

A review of the literature shows that numerous studies have been conducted to investigate the effect of intervention programs on the change of hypothesised mediators for exercise behaviours (Allen, 1996; Calfas, Sallis, Oldenburg, & Ffrench, 1997; Calfas et al., 2000; Fontaine & Shaw, 1995; Hallam & Petosa, 1998; Marcus & Stanton, 1993; Weiss, McCullagh, Smith, & Berlant, 1998). The results obtained from these studies on the intervention effect were equivocal. Even theoretically based interventions do not always prove to be effective in changing the mediators (Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999). Efforts to improve the design of interventions that change the mediators of leisure exercise behaviour are ongoing. For an effective intervention program, the model employed must predict behaviour and include procedures that enhance changes in exercise behaviour (Baranowski, Anderson, & Carmack, 1998). According to the SCT (Bandura, 1986), all behavioural changes are mediated by self-efficacy — a common cognitive mechanism. Self-efficacy is a personal judgement of one’s capability to successfully perform a task or activity in a specific situation. There are three determinants for human behaviour and their relationship is in a reciprocal causation: behaviour, internal personal factors, and external environment.

The benefits of leisure exercise are well documented (National Center for
Health Statistics, 2000; Ross, 2001; Ruskin, 2001; Sivan, 2001). Nevertheless, the school-aged children of Hong Kong are found to be sedentary and the time devoted to their homework increased with their school levels (Louie & Chow, 2003). The leisure exercise pattern of Hong Kong adults was also reported to be inactive. This has led to a greater focus on health-related problems and increased medical costs (Hong Kong Sports Development Board, 2001a). A sports participation survey reflected that the number of Hong Kong adult sports participants decreased 16% from the year 1998 to 2000 (Hong Kong Sports Development Board, 2000). Although the overall participation rate increased from 44% in 2000 to 48% in 2001 (Hong Kong Sports Development Board, 2001b), the participation rate was still considered to be low. It is commonly accepted that schools play an important role in students’ participation in leisure exercise (Burgeson, Wechsler, Brener, Young, & Spain, 2003). Thus, the school acts as an external environmental factor contributing to leisure exercise behavioural changes of students. Nevertheless, little research was conducted to investigate the role of the environment on the change of LEBE (Pender, 1998). The primary and secondary physical education curriculum in Hong Kong has been criticised for offering inadequate guidelines to physical education teachers (Johns, 2002). In Hong Kong, as the school compounds are normally small and crowded, it is not uncommon that primary school students are forbidden to run
during their recess time for safety and discipline reasons. Although the government has recommended that secondary schools should provide students with two physical education classes each week, many schools do not include any physical education classes for matriculation grades. It was observed that the teaching quality of Hong Kong physical education teachers varied (Johns, 2002). This contributed to a vast range of students’ ability in sports skills at university undergraduate level. Lack of skill is one of the perceived LEB for Hong Kong students (Speak, Lindner, & Li, 1993). When planning the physical education curriculum, the planners should take into account the cultural background of the students (Chung & Phillips, 2002). Of the eight universities in Hong Kong, only two offer a RPEP for the undergraduate students. The universities that offer RPEP often uphold the mission to provide students with a “Whole-Person Education”. In other words, the students are being educated holistically in respect to their physical, intellectual, and spiritual capacities. To fulfil the university mission, one of the objectives for the RPEP is to prepare the students for lifetime exercise and fitness. A number of the previous studies evaluated the effect that a university physical education program had on the promotion of physical activity (Brynteson & Adams II, 1993; Calfas et al., 2000; Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999; Sallis et al., 1999; Slava, Laurie, & Corbin, 1984). Only a few studies have reviewed the effect of an existing program with an
exercise efficacy intervention on students’ LEE and provided recommendations designed to increase university students’ participation in leisure exercise. A literature review revealed that Bandura’s self-efficacy theory (1997) has been applied extensively to interventions (e.g. Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999). The present study integrated Bandura’s theory into an existing RPEP to form an intervention strongly based on theory. The purposes of this study were as follows: 1) to investigate the effect of the RPEP with LEEI on the university students; 2) to investigate the role that the Hong Kong environment plays on changes in LEBE for university students; and 3) to identify possible ways to increase university students’ participation in leisure exercise.
Method

The paper was divided into two parts: Part 1 was conducted to assess the effect of the intervention on the LEE, LEM, LEB, and LEBE of the university students. Part 2 focused on investigating the possible methods that may be employed to increase university students’ LEBE.

Part 1

Participants

All participants were from an urban university with approximately 5,000 full-time students. Treatment group participants were first-year undergraduate students who enrolled in the RPEP. They were randomly selected to the conditioning and fitness class by the university enrolment computerised system according to their choice of activities. Students within the conditioning and fitness class were chosen as participants because of the nature of the activity. Other types of activities were considered to be too skill-specific and would have a bias effect on the intervention. Within the student cohort who took the RPEP were the students who eventually took the conditioning and fitness class and were representative of the 1,400 students who took RPEP that semester. A total of four conditioning and fitness classes were treated as the intervention groups. At baseline, there were 110 participants in the treatment
group. However, because of dropouts and data cleaning, a total of 93 participants (male = 50, female = 43) (mean age = 19.38, SD = .98) remained in the treatment group for data analysis. Control group participants were also undergraduate students, but did not enrol in RPEP during that semester. They were recruited through campus e-mail. At baseline, a total of 221 participants were recruited in this group. Once again, due to dropouts and data cleaning, the total number of control group participants was reduced to 147 (male = 53, female = 94) (mean age = 19.54, SD = 1.77) for data analysis. The treatment and control participants came from different departments and did not know each other and it was assumed that they had no direct methods by which they may communicate with each other about the intervention. Informed consents were obtained from the participants before data collection. The university ethical approval was secured prior to the commencement of the study.

**Instruments**

Three psychosocial factors (LEE, LEM, LEB) and the LEBE were measured in this study. The Leisure Exercise Efficacy Scale (LEES) developed by the investigators was used to measure the university students’ level of confidence to maintain an exercise program of more than 15 minutes per week during their leisure time for three months under 9 adverse situations. The development and validation
process was reported in another study (Ng, Cuddihy, & Fung, 2003a) (Appendix B).

The Motivation for Physical Activities Measure-Revised (MPAM-R) (Ryan, Frederick, Lopes, Rubio, & Sheldon, 1997) was employed to measure the LEM. The Leisure Exercise Barrier Questionnaire (LEBQ) (Ng, Cuddihy, & Fung, 2003b) developed by the investigators was adopted to measure the LEB (Appendix C). The Leisure-time Exercise Questionnaire (LTEQ) (Godin & Shephard, 1985) was used to assess the LEBE. All instruments used possessed good psychometric properties that are reported in Table 6.1.
<table>
<thead>
<tr>
<th>Instruments</th>
<th>Scores used for Data Analysis</th>
<th>Content</th>
<th>Psychometric Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEES (Ng, Cuddihy, &amp; Fung, 2003a)</td>
<td>Additive score 9 items, 11-point scale with 10-unit intervals.</td>
<td>The two factors explained 72.75% of variance. It ranges from 0 (cannot do), through 50 (moderately certain can do) to 100 (certain can do). Higher score represents stronger LEE.</td>
<td>Standardized item alphas were .84 and .86 for time 1 and time 2 respectively.</td>
</tr>
<tr>
<td>MPAM-R (Ryan, Frederick, Lepes, Rubio, &amp; Sheldon, 1997)</td>
<td>Additive score</td>
<td>Five factors were reported from the original source: enjoyment, appearance, social, fitness, and competence.</td>
<td>The factors accounted for 66% of the variance and the Cronbach alphas ranged from .78 to .92.</td>
</tr>
<tr>
<td>LEBQ (Ng, Cuddihy, &amp; Fung, 2003b)</td>
<td>Additive score</td>
<td>The questionnaire consisted of 19 items with four factors: social &amp; transport, personal-excuses, isolation, &amp; personal insecurity. The factors accounted for 61.24% of the variance explained.</td>
<td></td>
</tr>
<tr>
<td>LTEQ (Godin &amp; Shephard, 1985)</td>
<td>Total leisure exercise score (METs/week)</td>
<td>The total test-retest reliability was reported to be .74 from the primary source of information.</td>
<td></td>
</tr>
</tbody>
</table>
Study Design and Protocol

Part 1 employed a two-group repeated measures design. Data were collected on two occasions, prior to and following the semester. Those who enrolled in the RPEP were the treatment group and classified as the PEG, whereas those who did not enrol in any RPEP were classified as the NPEG. The treatment group received a LEEI which consisted of two one-hour weekly sessions for 10-weeks as described below, whereas the control group received no intervention at all. Participants in both groups were assessed on two occasions (baseline and post-intervention).

Leisure Exercise Efficacy Intervention (LEEI)

The LEEI was based on Bandura’s self-efficacy theory (1997), which was developed within the framework of the SCT. The RPEP lasted for three months, because of other teaching requirements for the course, the intervention could only last for 10 weeks. The intervention incorporated elements that were expected to increase students’ LEE into the normal RPEP. It was basically designed to promote adoption and maintenance of leisure exercise and designed to encourage change in the mediating variables, which included LEE, LEM, and LEB. The content of the LEEI included: 1) performance enhancement; 2) verbal/social persuasion; 3) social modelling/vicarious experiences; and 4) physiological arousal.
The course outline and intervention of the treatment group are shown in Table 6.2.
<table>
<thead>
<tr>
<th>Week</th>
<th>Course Outline</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction</td>
<td>Time management technique, goal setting, identification of exercise benefits and barriers</td>
</tr>
<tr>
<td>2.</td>
<td>Fitness room equipment Usage</td>
<td>Social modelling — videotape on successful models</td>
</tr>
<tr>
<td>3.</td>
<td>Skinfold measurements and theory</td>
<td>Handouts on physiological and emotional states during exercise, target heart rate</td>
</tr>
<tr>
<td>4.</td>
<td>Weight training</td>
<td>Verbal and social persuasion, buddy system, discussion on leisure exercise progress and elimination of exercise barriers, physiological response, target heart rate</td>
</tr>
<tr>
<td>5.</td>
<td>Aerobic dance</td>
<td>Verbal and social persuasion, buddy system, discussion on leisure exercise progress and elimination of exercise barriers, physiological response, target heart rate, social modelling</td>
</tr>
<tr>
<td>6.</td>
<td>Endurance run</td>
<td>Verbal and social persuasion, buddy system, discussion on leisure exercise progress and elimination of exercise barriers, physiological response, target heart rate</td>
</tr>
<tr>
<td>7.</td>
<td>Circuit training</td>
<td>Verbal and social persuasion, buddy system, discussion on leisure exercise progress and elimination of exercise barriers, physiological response, target heart rate</td>
</tr>
<tr>
<td>8.</td>
<td>Step aerobics</td>
<td>Verbal and social persuasion, buddy system, discussion on leisure exercise progress and elimination of exercise barriers, physiological response, target heart rate, social modelling</td>
</tr>
<tr>
<td>9.</td>
<td>Endurance run</td>
<td>Verbal and social persuasion, buddy system, discussion on leisure exercise progress and elimination of exercise barriers, physiological response, target heart rate</td>
</tr>
<tr>
<td>10.</td>
<td>Relaxation technique</td>
<td>Progressive relaxation technique</td>
</tr>
<tr>
<td>11.</td>
<td>Practical examination</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Practical examination</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Summary</td>
<td></td>
</tr>
</tbody>
</table>
**Quantitative Data Analysis**

Quantitative data analysis was performed to examine the effect of the intervention on the LEE, LEM, LEB, and LEBE. All data were analysed using SPSS version 11.0 for windows.

Unequal sample size was noted from the treatment and control groups. To avoid problems arising from unequal sample size in factorial design, random deletion of cases was conducted (Tabachnick & Fidell, 2001). After the deletion process, the number of participants in each of the treatment, control, male, and female cell was 43 and the total number left for data analysis was 172 participants.

A 2 x 2 x 2 (Group x Gender x Assessment Timeline) repeated measures analysis of variance was conducted to examine the intervention effect on LEE, LEM, LEB, and LEBE. The within-subject factor was the assessment timeline (baseline and post intervention). The two between-subject factors were group (treatment/control) and gender (male/female).

**Part 2**

**Semi-structured Interviews**

In order to identify the ways to increase university students’ participation in leisure exercise, one-on-one semi-structured interviews were conducted. Ten
respondents (male = 5 & female = 5) were randomly selected from the treatment
group after the intervention to attend a semi-structured interview. Each interview
lasted for about 30 minutes. As there were not many questions asked during the
interviews, this duration was considered to be sufficient for establishing
trustworthiness of the data collected (Gerdes & Conn, 2001). A facilitator was
trained by one of the investigators to ask questions and probe the respondents.
Respondents were asked to provide suggestions on how to increase the amount of
time university students spent on exercise during their leisure time. Two pilot
interviews were conducted and recorded by the facilitator. After the pilot interviews,
the investigators refined the interview guide.

Prior to the interviews, permission was obtained from the participants to
audiotape record the interviews. All interviews were transcribed in full by the
investigator immediately upon completion of the interviews. To ensure the
trustworthiness of the data, the transcripts were returned to the respondents for their
feedback. This served as a reliability check to avoid errors in misinterpretation.
Amendments were made after obtaining the respondents’ feedback.
**Qualitative Data Analysis**

Microsoft Word 2000 was used to type the transcriptions and Microsoft Excel 2000 was employed to organise the data to facilitate content analysis.

To demonstrate the credibility of the data interpretation, peer debriefing was performed (Biddle, Markland, Gilbourne, Chatzisarantis, & Sparkes, 2001). Three researchers coded the transcript independently and agreed on the emerged themes. Content analysis included both deductive and inductive analyses (Miles & Huberman, 1994).

**Results**

**Part 1**

**Descriptive Statistics**

Table 6.3 shows the means and standard deviations for all dependent variables of the two groups and two assessment periods of all participants. No significant differences were found between treatment and control groups at baseline in LEE, LEM, LEB, and LEBE (p < .05).
Table 6.3. Means and Standard Deviations for all Dependent Variables by Groups and Assessment Periods of all Participants (n = 172)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Assessment Period</th>
<th>Baseline</th>
<th>Post-Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td><strong>Leisure Exercise Efficacy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Treatment (n=43)</td>
<td></td>
<td>475.58(147.41)</td>
<td>449.07(127.52)</td>
</tr>
<tr>
<td>Male Control (n=43)</td>
<td></td>
<td>456.05(155.90)</td>
<td>479.54(150.17)</td>
</tr>
<tr>
<td>Female Treatment (n=43)</td>
<td></td>
<td>392.09(160.68)</td>
<td>421.16(154.26)</td>
</tr>
<tr>
<td>Female Control (n=43)</td>
<td></td>
<td>372.79(184.37)</td>
<td>389.30(139.14)</td>
</tr>
<tr>
<td><strong>Leisure Exercise Motives</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Treatment (n=43)</td>
<td></td>
<td>147.72(23.12)</td>
<td>145.70(21.77)</td>
</tr>
<tr>
<td>Male Control (n=43)</td>
<td></td>
<td>135.30(27.43)</td>
<td>135.72(22.01)</td>
</tr>
<tr>
<td>Female Treatment (n=43)</td>
<td></td>
<td>128.42(29.38)</td>
<td>136.42(26.66)</td>
</tr>
<tr>
<td>Female Control (n=43)</td>
<td></td>
<td>131.14(25.80)</td>
<td>129.86(27.23)</td>
</tr>
<tr>
<td><strong>Leisure Exercise Barriers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Treatment (n=43)</td>
<td></td>
<td>53.30(15.65)</td>
<td>57.14(17.42)</td>
</tr>
<tr>
<td>Male Control (n=43)</td>
<td></td>
<td>59.02(18.07)</td>
<td>66.98(20.91)</td>
</tr>
<tr>
<td>Female Treatment (n=43)</td>
<td></td>
<td>53.49(15.87)</td>
<td>59.02(13.62)</td>
</tr>
<tr>
<td>Female Control (n=43)</td>
<td></td>
<td>52.26(17.11)</td>
<td>61.91(16.48)</td>
</tr>
<tr>
<td><strong>Leisure Exercise Behaviours (METs/week)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Treatment (n=43)</td>
<td></td>
<td>36.42(31.38)</td>
<td>30.60(12.57)</td>
</tr>
<tr>
<td>Male Control (n=43)</td>
<td></td>
<td>32.20(31.39)</td>
<td>30.85(25.20)</td>
</tr>
<tr>
<td>Female Treatment (n=43)</td>
<td></td>
<td>25.16(20.26)</td>
<td>26.70(17.66)</td>
</tr>
<tr>
<td>Female Control (n=43)</td>
<td></td>
<td>23.77(22.55)</td>
<td>22.16(19.00)</td>
</tr>
</tbody>
</table>
**Intervention Effect**

The results of the repeated measures analysis of variance are shown in Table 6.4. Results of the repeated measures ANOVA showed that there were no significant 3-way interaction effects (Group x Gender x Assessment Time) or 2-way interaction effects (Gender x Assessment Time) (Group x Assessment Time) for all variables. There was no evidence of an intervention effect because no interaction was significant.
Table 6.4. Results of Repeated Measures ANOVA for Leisure Exercise Efficacy, Leisure Exercise Motives, Leisure Exercise Barriers and Leisure Exercise Behaviours (n = 172)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Contrast</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leisure Exercise Efficacy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group x Assessment Time</td>
<td>.63</td>
<td>.43</td>
<td></td>
</tr>
<tr>
<td>Gender x Assessment Time</td>
<td>1.05</td>
<td>.31</td>
<td></td>
</tr>
<tr>
<td>Group x Gender x Assessment Time</td>
<td>1.75</td>
<td>.19</td>
<td></td>
</tr>
<tr>
<td><strong>Leisure Exercise Motives</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group x Assessment Time</td>
<td>.67</td>
<td>.41</td>
<td></td>
</tr>
<tr>
<td>Gender x Assessment Time</td>
<td>1.00</td>
<td>.32</td>
<td></td>
</tr>
<tr>
<td>Group x Gender x Assessment Time</td>
<td>1.98</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td><strong>Leisure Exercise Barriers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group x Assessment Time</td>
<td>2.08</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>Gender x Assessment Time</td>
<td>.36</td>
<td>.55</td>
<td></td>
</tr>
<tr>
<td>Group x Gender x Assessment Time</td>
<td>.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td><strong>Leisure Exercise Behaviours</strong></td>
<td>(METs/week)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group x Assessment Time</td>
<td>.03</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>Gender x Assessment Time</td>
<td>.71</td>
<td>.40</td>
<td></td>
</tr>
<tr>
<td>Group x Gender x Assessment Time</td>
<td>.81</td>
<td>.37</td>
<td></td>
</tr>
</tbody>
</table>
Part 2

Perceptions of Leisure Exercise Barriers to University Students

When the respondents were asked to suggest ways to increase university students’ participation in leisure exercise, they identified a number of possible LEB that needed to be overcome. The three perceived barriers were: 1) Time; 2) Attitude towards exercise; and 3) Structural.

1) “Time” barrier: Lack of time was the common perceived barrier to actively participating in leisure exercise cited by the university students. A perception existed that many students placed too much emphasis on their academic results. During term time, the students always had a tight schedule because of the heavy demands from the university workload.

2) “Attitude towards exercise” barrier: Respondents suggested that some students did not recognise the benefits of exercise. One critical concern was whether or not they had friends accompanying them to exercise. A lack of sense of belonging in the university was also one of the perceived exercise barriers.

3) “Structural” barrier: Transportation from home to exercise facilities was identified as one of the perceived exercise barriers. They found it more convenient to exercise within the university compound.

To illustrate interviewees’ responses on the perceived LEB, examples of the
quotes are listed in Table 6.5.

Table 6.5. Illustration of Quotes for the Leisure Exercise Barriers Identified by the University Students

<table>
<thead>
<tr>
<th>Leisure Exercise Barriers</th>
<th>Examples of Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time</strong></td>
<td>“It’s because of the heavy workload from the University. I don’t have time to exercise.”</td>
</tr>
<tr>
<td></td>
<td>“The highest priority for university students is to study. They are busy on homework and don’t have much time.”</td>
</tr>
<tr>
<td></td>
<td>“I attend classes till 6:30 p.m. After dinner, it’s already 8 p.m., I still need to finish homework and do revision. How can I find a time to do exercise?”</td>
</tr>
<tr>
<td></td>
<td>“Bearing the fact that their family does not give them pocket money, they need to do part time job to earn money, which lessen their time to exercise.”</td>
</tr>
<tr>
<td><strong>Attitudes towards exercise</strong></td>
<td>“When the students have time, they would prefer to sleep, to do homework, or to revise, and they would not do exercises. Perhaps, they may think doing exercises is a ‘waste of time’, and they do not recognise the benefits of exercise. When they have time, even if there is gym room, they would not go there and do exercises.”</td>
</tr>
<tr>
<td></td>
<td>“Friends have an influence. But it is quite hard to find a group of friends who love to play sports together.”</td>
</tr>
<tr>
<td><strong>Structural</strong></td>
<td>“It is reasonable to charge my accompanying friend, but it is not right to charge on me. Because if it charges on me, I would rather go to the public facilities to play because the place I live is quite a distance from the University.”</td>
</tr>
</tbody>
</table>
The Dimensions of Ways to Increase University Students’ Participation in Leisure Exercise

Based on the data collected, analyses were made on the ways to increase the time university students spent on leisure exercise. The general dimensions with higher and lower order themes were identified.

From the twenty-five lower order themes, the higher order themes were formed and three general dimensions emerged: reinforcement of LEE, enhancement of LEM, and development of university sports culture. Table 6.6 shows the dimensions of ways to increase university students’ participation in leisure exercise.
<table>
<thead>
<tr>
<th>Lower Order Themes</th>
<th>Higher Order Themes</th>
<th>General Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Change of present life-style</td>
<td>Increased dedication and commitment to leisure exercise</td>
<td>Reinforcement of LEE</td>
</tr>
<tr>
<td>2. Develop exercise habit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Effective time management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Gain physiological knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Goal setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Learn more sports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Dormitory life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Peer influence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Recognise exercise benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Body shape</td>
<td>Improved appearance, challenge, competence, fun and enjoyment, physical and social aspects</td>
<td>Enhancement of LEM</td>
</tr>
<tr>
<td>2. Convenience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Exposure to exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Excitement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Fun &amp; enjoyment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Relax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Social</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Voluntary participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Adequate sports facilities</td>
<td>The university should play an active role in the promotion of leisure exercise</td>
<td>Cultivation of University Sports Culture</td>
</tr>
<tr>
<td>2. Develop exercise atmosphere</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Encourage students to live in dormitory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Increase required physical education course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Introduce new sports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Provide more channels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Promote importance of leisure exercise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reinforcement of Leisure Exercise Efficacy

Nine lower order themes combined to form the higher order theme — “increased dedication and commitment to leisure exercise”. The lower order themes referred to the “change of present lifestyle”, “effective time management”, “gain physiological knowledge”, “goal setting”, “learn more sports”, “have an on campus student residence life”, “peer influence”, “place exercise on priority list”, and “recognise exercise benefits”.

Enhancement of Leisure Exercise Motives

This dimension consisted of nine lower order themes which combined to form the higher order themes “improved appearance”, “challenge”, “competence”, “fun and enjoyment”, “physical and social aspects”. Lower order themes were "body shape", "convenience", "exposure to exercise", "excitement", “fun and enjoyment”, “interest”, “relaxation”, “social”, and “voluntary participation”.

Cultivation of University Sports Culture

The higher order theme of this dimension was that “the university should play an active role in the promotion of leisure exercise”. The seven lower order themes included: “adequate sports facilities”, “develop an exercise atmosphere”,...
“encourage students to live in student residence on campus”, “increase required physical education courses”, “introduce new sports”, “provide more channels”, and “promote importance of leisure exercise”.

Table 6.7 shows examples of the comments from the respondents on the three general dimensions.
Table 6.7. Illustration of Quotes for the Dimensions of Ways to Increase University Students’ Participation in Leisure Exercise

<table>
<thead>
<tr>
<th>General Dimensions</th>
<th>Examples of Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforcement of LEE</td>
<td>“like walking from the mass transit railway station to the university instead of taking the mini-bus”, “better time management”, “living in the dormitory, students don’t have to waste time on travelling, they can squeeze time in doing exercise”, “going to university, time is more flexible, and we can squeeze time to do exercises in weekend”, “to set a time table for each week, no matter more or less, a period of time should be spared out for exercises”, “students should treat exercise as a necessity” and “develop an exercise habit as early as possible in their childhood”.</td>
</tr>
<tr>
<td>Enhancement of LEM</td>
<td>“As long as you have interest, you will play”, “can have the peer-interaction”, “depends on personal desires and interests”, “excited with competition”, “if more courses, students’ exposure would be enlarged, and their interest would be cultivated”, “need to motivate myself to do exercises voluntarily”, “not so fat, I do not need to be puffy in Winter”, “the best exercise would be the most convenient to me”, “perhaps we could change from singing karaoke to doing exercise when we go out with friends”, “relax”, and “you may find fun from within”.</td>
</tr>
<tr>
<td>Cultivation of University Sports Culture</td>
<td>“It's better if we can have the atmosphere of doing exercise”, “promote exercise can release stress”, “the on campus halls of residence can help to develop a habit in doing leisure exercise”, “lecturers should not give too much homework and term papers to students”, “provide interest clubs to attract students”, “people should be influenced progressively on their leisure exercise habits, not just to talk about reform of education or theories because they are just something on paper”, “required physical education subjects are useful, they provide opportunities for students to exercise”, and “sports facilities should be free of charge for students”.</td>
</tr>
</tbody>
</table>
Discussion

The use of both quantitative and qualitative data analysis for this study is seen to be complementary. This is in line with the suggestion that the use of both methods can overcome the weaknesses of each individual approach (Hammersley, 1996) and conform with the concept of polyvocality (Sparkes, 1991). Previous studies demonstrated the effectiveness of using the two approaches in their investigation (Hendry, Kloep, Espnes, Ingebrigtsen, Glendinning, & Wood, 2002; Smith & Biddle, 1999). While the quantitative data provided basic empirical evidence to the study, the qualitative data were useful to explore new ideas that cannot be discerned by the quantitative data (Gall, Borg, & Gall, 2003).

Contrary to expectations, it is surprising to see that the strongly theoretical-based intervention was not effective in changing LEE, LEM, LEB, and LEBE for the sample of this study. From a different standpoint, one plausible explanation for this phenomenon is that the students placed the university workload as their top priority and this was not easily changed by an intervention that was conducted for only 10-weeks. Although all efforts have been made to maximise the effect of the intervention, it was inevitable that the treatment effect was confounded by extraneous variables. From the semi-structured interviews, it may be seen that the confounding variables of the intervention included the heavy university workload and
examinations, part-time job pressure, and the lack of a sports culture in the university.

Through content analysis, the ways to increase university students’ participation in leisure exercise were explored. As a means to illustrate the qualitative data obtained, a framework to promote LEBE amongst university students was developed and shown in Figure 6.1.

![Figure 6.1. A Framework to Promote Leisure Exercise Behaviours of University Students](image-url)
Possible study limitations include the followings:

1) Participants were students from a RPEP. Although they participated in this study voluntarily, they could not be exempted from the physical education class. Thus, their LEE, LEM, LEB, and LEBE might not be completely independent from other influential factors. Possible factors include the academic demands from their degree course which overshadowed the intervention and caused the failure of the intervention.

2) Another limitation was the duration and the nature of the intervention. Based on the university calendar, only a 10-week intervention with the participants could be conducted. With such a short duration, it may be difficult to expect significant changes in students’ LEBE. Moreover, the intervention was embedded in an educational setting and not in the leisure context.

3) A third limitation was the teacher to student ratio in the class. There were about thirty students in one class and the class size was considered to be too big to provide augmented feedback to the treatment group participants.

4) A fourth limitation was the self-report measure of LEE, LEM, LEB, and LEBE. The results might not truly reveal the participants’ condition.

Our findings reveal that the obtained MET levels of this study at baseline and post-intervention (see Table 6.3) are lower than Taiwan high school students and
far lower than the U.S. high school students (Chung & Phillips, 2002). When comparing our findings with university students from a western culture, lower levels of leisure exercise are also observed (Hayes, Crocker, & Kowalski, 1999). While no significant changes in the dependent variables may be attributed to RPEP with LEEI on the university students, this study could be viewed to have reflected the “real-life” situation of the Hong Kong university students. As the samples were collected from one university only, one should be careful not to generalise the findings. As mentioned earlier, there are currently two universities in Hong Kong offering RPEP, it is therefore recommended to replicate the study in the other university and to expand the sample size. This would enable a better understanding of possible ways to improve the LEE and LEBE of university students.

In Hong Kong, a major task of the university leisure studies and physical education personnel is to maintain and enhance university students’ LEBE. Based on the qualitative results obtained in this study, the following activities are recommended:

1) Collaboration: The promotion of health benefits should start long before the university level. Students’ physical education should begin in their pre-school education. Students must develop a leisure exercise habit at an early age (Dishman, 1988). It is therefore, important for universities, secondary schools, primary schools,
and kindergartens to have some collaboration on the promotion of the health benefits, both skill and cognitive aspects from leisure exercise.

2) Physical education curriculum and teacher development: The physical education curriculum must be reviewed across all school levels. Guidelines must be clearly specified for all physical education personnel. Regular in-service training must be provided for physical education teachers to ensure their teaching quality.

3) Exercise benefits promotion campaign: A regular promotion campaign should be carried out in the university to educate students about the benefits to be gained from regular physical activity and to develop an environment that encourages physical activity in the university. As peer influence is one of the influential factors for students’ participation, the academic societies and interest clubs should be encouraged to assist in the promotion campaign in order to attract more students.

4) Intramural activities and interest clubs: Most of the students quoted their participation motives of leisure exercise came from their friends and a desire to seek enjoyment and fun. More intramural activities and interest clubs related to exercise should be organised. Their role can be to introduce new sports to attract students, and/or to serve as an exercise channel for the students to participate in leisure exercise.

5) Annual Open/Fun Day: Organise Annual Open/Fun Day on campus with the
National Sports Associations and other sports organisations to promote various sports and leisure exercises.

6) Fun element: The fun element should be emphasised in the required physical education curriculum so as to increase the participation motives of the students both in and out of the physical education class. Enjoyment can influence students’ participation intention and increase LEE in LEBE (Bungum, Dowda, Weston, Trost, & Pate, 2000).

7) Increase of required physical education: Physical education is considered to be an important source for university students to develop life-long leisure exercise habits (Ferguson, Yesalis, Pomrehn, & Kirkpatrick, 1989). However, at present the two universities offering required physical education only request students to attend physical education in one of their three years of study. It is a common phenomenon that the students are “out of sight, out of mind” i.e. they would never participate in any leisure exercise in addition to the required physical education sessions. It would be helpful in developing students' own leisure exercise habits if they are required to take physical education every year throughout their undergraduate study.

8) Training on time management: As noted from this study, perceived lack of time was the most frequently cited barrier. Students should be taught effective methods to eliminate their perceived exercise barriers. To facilitate students’ participation in
leisure exercise, the university should organise more training courses on time
management.

9) With regard to halls of residence life on campus, ‘convenience’ is always one
important factor for students’ participation in leisure exercise. At present, almost all
universities in Hong Kong provide their students with the opportunity to live on
campus in halls of residence. The university should encourage more students to live
in the halls of residence on campus so that they could reduce the time spent travelling
and devote more time enjoying the university sports facilities.

The present study focused on an investigation of the effect of the RPEP with
LEEI, the role that the Hong Kong environment plays on the change of LEBE for
university students and identification of possible ways to increase their participation
in leisure exercise. Lack of time was the barrier commonly cited by the university
students. This is consistent with the results obtained from Myers and Roth (1997).
Our results did not show significant changes in the university students’ LEE, LEM,
LEB, and LEBE after the intervention programme. The results support the findings
of other studies that an intervention will not always show to be effective (Baranowski,
Anderson, & Carmack, 1998; Hallam & Petosa, 1998; Howe & Poole, 1992; Keller,
Fleury, Gregor-Holt, & Thompson, 1999; Marcus & Stanton, 1993; Pender, 1998).
One possible explanation of the current conclusion may be found in the nature of the
student environment, in this case — the cultural background of the Hong Kong students. This environmental factor is in the same direction as recommended by Marcus et al. (2000) in their study that environment influences the promotion of LEBE. In future, when designing an intervention, a better understanding of the cultural background of the participants should provide a more informed approach to increasing the effectiveness of the intervention on LEE, LEM, LEB, and LEBE of university students.
CHAPTER 7

CONCLUSIONS

Introduction

Leisure exercise can promote greater life satisfaction and a sense of well-being that has gained increased importance and value in today’s society (Edginton, Jordan, DeGraaf, & Edginton, 2002). University students are young adults who strive for an enhanced quality of life and the university plays an important role in shaping their LEBE. Hong Kong is a special administrative region of China with a unique sport culture (Fu, 1993; Hui, 2004). University students in Hong Kong were found to be mainly sedentary with a low participation rate in LEBE (Fu, Chow, Chung, & Louie, 1998). The use of an intervention technique to investigate the LEBE of Hong Kong university students has not been reported previously. The present study is an empirical study that aims to identify two sets of relationships: 1) the relative contribution of the selected psychosocial variables: LEE, LEM, and LEB in the prediction of university students’ LEBE; and 2) the effectiveness of a 10-week intervention to increase the university students’ LEE, LEM, LEBE, and to decrease their LEB.

The theoretical framework of the present study is largely built on the
self-efficacy theory developed within the framework of SCT (Bandura, 1986). The theory suggests that behaviour, personal factors, and environment interact as bidirectional determinants of one another. In this study, LEE, LEM, and LEB were selected as a possible representation of the internal personal factors of the triadic reciprocal causation (Bandura, 1986). A literature review highlighted that most reported findings on university students’ LEBE were set in a Western culture. A lack of investigation within different cultures might result in the conclusions being particularistic, or even misleading in their presumed generalisability of the theoretical framework (Duda & Hayashi, 1998). The present research contributes by providing quantitative and qualitative data on Asian university students’ LEBE in general and a better understanding of the Hong Kong situation in particular. Results and findings were reported in three articles published in peer-reviewed journals.

This chapter is composed of five sections: 1) overall discussions on the research findings; 2) limitations; 3) implications of findings; 4) recommendations for future research; and 5) conclusions.
Overall Discussions on Research Findings

The present study used both quantitative and qualitative research methods. Results show that the adoption of both methods generated more mutually supportive data for analysis. This is in line with the concept of polyvocality as suggested by Sparkes (1991). The two methods provide different approaches to data analysis but complement each other (Hammersley, 1996).

As there were no suitable scales to measure the LEE and LEB of Hong Kong university students, the 9-item LEES (see Chapter 4) and the 19-item LEBQ (see Chapter 5) were developed for data collection. Exploratory factor analyses were conducted to investigate the constructs that help explain the inter-correlations among the scale items. The LEES was found to have two separate factors: Time/Energy and Intrapersonal which explained 72.75% of the variance. The LEBQ was found to have four separate factors: Social and Transport, Personal-excuses, Isolation, and Personal Insecurity which accounted for 61.24% of the variance explained. These findings confirm the multidimensional nature of the LEE (Sallis, Pinski, Grossman, Patterson, & Nader, 1988; Stevens, Dijk, Greef, Lemmink, & Rispens, 2001) and the LEB (Bourdeauduij, Sallis, & Vandelanotte, 2002; Myers & Roth, 1997). Both scales possess favourable psychometric properties and are easy to administer. Most importantly, both scales are contextually and culturally specific. Past studies
reviewed that exercise efficacy and exercise barrier scales were not frequently used in the prediction of long-term exercise behaviours (McAuley & Mihalko, 1998). The use of LEES and LEBQ can thus shed some light on this area.

The present study developed the Model of University Students’ Leisure Exercise Behaviours (MUSLEB) and provided information on the predictive role of the three selected variables (LEE, LEM, and LEB) on the university students’ LEBE (see Chapter 5). A number of goodness-of-fit measures that included the chi-square test statistics, the comparative fit index, and the root mean square error of approximation showed that the re-specified model was tenable. LEE was found to have a significant and direct effect on post 3-month LEBE. The result is consistent with findings of other path analysis studies suggesting that self-efficacy has a substantial impact on exercise behaviours (Duncan & Stoolmiller, 1993; Ozer & Bandura, 1990). It also supports the findings that self-efficacy exhibits its predictive role on peoples’ LEBE (Conn, 1998; Dzewaltowski, 1989; Rovniak, Anderson, Winett, & Stephens, 2002). The results of the present study revealed that LEE had direct and significant effect on concurrent LEM for undergraduate students, but with no effect on the post 3-month LEM. The findings are similar to a previous report indicating that LEE is a positive predictor variable of LEM (Chase, 2001). The baseline LEE was found to have a significant negative effect on post 3-month LEB.
This confirms the finding that when measuring self-efficacy, the potential perceived exercise barriers should be considered (Tsai, 2002). Perceived barriers have been demonstrated to be negatively associated with exercise efficacy (Hofstetter, Sallis, & Hovell, 1990). However, the post 3-month LEE was observed to have an unexpected positive significant effect on the post 3-month LEB. Bandura’s (1997) suggestion that the external environment plays an important role in determining human behavior was used to explain this phenomenon. As the second data collection period was near to the end of the semester examinations, many university students reflected their worries in their perceived LEB. Past studies have demonstrated a positive relationship between exercise motivation and exercise behaviours (Iso-Ahola & St. Clair, 2000; Oman & McAuley, 1993), however, the current study results did not support the predictive role of the LEM on LEBE.

Although there are limitations to every research study, the congruence between the findings of the present study and previous research suggests that there is positive relationship between LEE and LEBE (see Chapter 5). Specifically, the findings were consistent with previous research, in that exercise efficacy was found to have an enhancing impact on exercise behaviours (Allison, Dwyer, & Makin, 1999; Hagger, Chatzisarantis, & Biddle, 2001; Leveille, Cohen-Mansfield, & Guralnik, 2003; McAuley, Lox, & Duncan, 1993; Moritz, Feltz, Fahrbach, & Mack, 2000;
Wakui, Shimomitsu, Odagiri, Inoue, Takamiya, & Ohya, 2002). In addition to a positive relationship with LEBE, LEE was found to be positively related to concurrent perceived LEM. The LEM is considered to be important in physical education and sport settings (Deci & Ryan, 1985; Mitchell, 1996). The obtained results are consistent with previous studies (Bandura 1991; Feltz & Chase, 1998; McAuley, Duncan, & Wraith, 1991; Oman & McAuley, 1993) which suggest that self-efficacy plays an important role in the motivational process. The findings are also in line with the qualifier provided by Bandura (1977) on the predictive role of self-efficacy judgements — self-efficacy belief is a major determinant only when people have adequate incentives.

The levels of leisure exercise efficacy, leisure exercise motives, leisure exercise barriers, and leisure exercise behaviours of Hong Kong university students were identified by obtaining the means and standard deviations at both baseline and post-intervention periods (Chapter 6). It is obvious that the MET level obtained from this study is much lower than those obtained from a group of Canadian undergraduates in a study conducted by Hayes, Crocker, & Kowalski (1999) which also used LTEQ as a measuring instrument. From this, we can see that Hong Kong students are relatively sedentary when compared to their western counterparts.

There is a growing need to apply intervention programmes to the Hong
Kong people to educate them on the importance of leisure exercise (Hui & Morrow Jr., 2001). However, knowledge in designing an effective intervention which may enhance leisure exercise is still at a rudimentary stage (Marcus, Dubbert, Forsyth, McKenzie, Stone, Dunn, & Blair, 2000). The present study implemented a 10-week intervention (LEEI) aimed to promote adoption and maintenance of leisure exercise in university students. Based upon the results obtained from the experimental design, it is apparent that there was no behavioural change due to the LEEI (see Chapter 6). The findings are similar to the previous reports which reported that their interventions did little to change the exercise behaviours of the university students (Calfas et al., 2000; Cardinal, Jacques, & Levy, 2002; Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999; Sallis et al., 1999). These results also agreed with other studies where the intervention was not always effective (Baranowski, Anderson, & Carmack, 1998; Calfas, Sallis, Oldenburg, & Ffrench, 1997; Evans & Hardy, 2002; Hallam & Petosa, 1998; Howe & Poole, 1992; Keller, Fleury, Gregor-Holt, & Thompson, 1999; Marcus & Stanton, 1993; Pender, 1998). It is suggested that of the reasons why the present intervention was ineffective might be created by the low sensitivity of the measuring instruments adopted in this study. Another reason might be due to the specificity of the western-culture-oriented intervention techniques adopted in the present study. The content of the LEEI included: performance
enhancement, verbal/social persuasion, social modelling/vicarious experiences, and physiological arousal which were originally from the western culture. The perception and problem-solving ability of Hong Kong people are different from those from the western culture. This phenomenon might constitute a possible and plausible explanation for the ineffective intervention. The finding is consistent with the suggestion that a culturally-specific intervention for Hong Kong Chinese should be developed to cope with the Hong Kong situation (Hui, 2004).

The influence of the local environment was evaluated via the qualitative data. The low participation rate of the university students were discussed in terms of this factor — an area that is under-researched (Pender, 1998). This suggestion agrees with Bandura’s triadic reciprocal causation that environment plays a key role in determining leisure exercise behaviours. It also supports the observation that an intervention needs to address the environmental barrier (Marcus, 1995). An individual and his/her environment are operating within one system, they should be viewed as an integrative and complex process (Bar-Eli, 1996). One of the possible environmental factors identified was the cultural background of Hong Kong university students. This is consistent with the suggestion that the culture of Hong Kong Chinese is different from a Western culture (Hui, 2004). Culture includes “shared attitudes, beliefs, categorizations, expectations, norms, roles,
self-determinations, values, and other such elements of subjective culture found among individuals whose interactions are facilitated by shared language, historical period, and geographic region” (Triandis, 1972, p. 3). Differences between the western sport culture and Hong Kong sport culture are inevitable. As mentioned in Chapter one, Hong Kong Chinese place much greater emphasis on academic achievement and ignore the importance of physical and psychological health (Fu, 1993). This widens the cultural differences between Hong Kong Chinese and Western people on LEBE. Past research findings found that the cultural background has a great impact on university students’ attitude towards LEBE (Chung & Phillips, 2002). It has been shown that Australian university students have higher active recreation self-efficacy beliefs and pursue a more active leisure lifestyle than Hong Kong university students (Tsai, 2002). One major reason why Hong Kong university students are generally sedentary is the lack of a sports culture in Hong Kong (Fu, 1993). One possible way to change the LEBE of Hong Kong university students is to develop a sports culture in the territory.

The Hong Kong Sports Development Board (2001c) has indicated that students’ exercise participation rates were improving but still not satisfactory. Most Hong Kong residents were unaware of heath benefits of leisure exercise (Hui & Morrow Jr., 2001). Students in Hong Kong devoted most of their leisure-time on
watching television, shopping, and playing computer games (Ng, 1996a). The exercise levels of Hong Kong students decreased with age (Louie & Chow, 2003; Ng, 1997). Major reasons that contributed to a sedentary lifestyle of Hong Kong students were the Chinese culture, a competitive examination system, a crowded living environment, and a lack of sports skills. As such, it was always going to be a very difficult challenge to convince sedentary university students to adopt an exercise programme and maintain healthy behaviour. At the early stage of an exercise programme, one can hardly find enjoyment and fun as it is often associated with muscle pain, fatigue, and possible injury (McAuley & Mihalko, 1998). The task to change the sedentary LEBE of Hong Kong university students remains challenging.

In the past, few sport and physical education practitioners have employed and used qualitative research methods in their investigations (Gerdes & Conn, 2001). The qualitative approach is becoming more of an accepted form of inquiry in sport and physical education research (Cote, Salmela, Baria, & Russell, 1993; Dale, 1996). This is because it helps promote a better understanding of a behavioural intervention effects and may indicate ways of promoting leisure exercise behaviour (Baranowski, Anderson, & Carmack, 1998). The present study employed a qualitative data analysis to obtain results on the ways to increase university students’ participation in leisure exercise (see Chapter 6). Content analysis included both deductive and inductive
analyses (Miles & Huberman, 1994).

Perceived barriers are a major determinant of leisure exercise (Sallis, Prochaska, & Taylor, 2000). From the semi-structured interviews, three perceived LEB were identified. These were 1) time; 2) attitude towards exercise; and 3) structural (see Chapter 6). Timetable clash was one of the reasons that affected students from participating in leisure exercise. Some respondents complained that they had classes from morning to evening. Although they had breaks between classes, they still had to make use of the time to complete assignments and revision. Furthermore, the opportunity for leisure exercise was not always utilised when the students had to work in part-time jobs. The most frequent exercise barrier cited by the students was the lack of time. Previous research findings indicated that a lack of time was reported as the major perceived exercise barrier (Lindner, 1997; Sivan & Robertson, 1993; Sleap & Wormald, 2001). The present finding is consistent with findings from previous studies using university students as the sample (Steinhardt & Dishman, 1989) — a lack of time was the top LEB they perceived. Similarly, in a study conducted with Hong Kong university students, lack of time was also found to be the major factor affecting active participation (Lindner & Speak, 1995). However, the lack of time could suggest that university students lack self-motivation (Bowles, Morrow Jr., Leonard, Hawkins, & Couzelis, 2002). Hong Kong university students
must come to understand the value of participating in leisure exercise so that their exercise motivation may be enhanced (Mitchell, 1996). When the results are applied to the design of this intervention programme, additional motivational strategies might be needed to enhance exercise behaviours among the students in order to be successful. Perceived LEB could be viewed as excuses for an inactive lifestyle and would remain prominent throughout adulthood. Therefore the timing for the commencement of the intervention is important — it should start from early childhood. Early interventions to change students’ LEBE could have long-term effects (Bourdeaudhuij, Sallis, & Vandelanotte, 2002).

The qualitative analysis provided insights for the investigator and nine activities were recommended to promote the LEBE for university students of Hong Kong. They are: 1) collaboration; 2) physical education curriculum and teacher development; 3) exercise benefits promotion campaign; 4) intramural activities and interest clubs; 5) annual open/fun day; 6) fun element; 7) increase in the amount of required physical education; 8) training on time management; and 9) with regard to halls of residence life on campus (see Chapter 6 for details). To fulfil all these recommendations, it is suggested that there must be efforts from the whole society and not be restricted to purely the university environment.
Limitations

The following limitations need to be acknowledged and the findings need to be interpreted with caution.

One of the limitations in this study was the lack of a culturally-specific intervention for the Hong Kong university students. The intervention adopted in this study was based on Bandura’s (1997) four principal sources of information on self-efficacy which was western-culture-oriented. The implemented content might not have fully served the needs of Hong Kong university students.

As this study included an intervention, if more than one instructor was employed to conduct the intervention, then a potential confounding variable would be introduced. Consequently, the present study was limited by using university students from only one university and one instructor. This limitation also led to a relatively small number of students in the sample for this study.

The teacher-student ratio in the intervention class was considered to be too big to provide quality augmented feedback to the treatment group. The intervention duration was restricted by the university calendar and only a 10-week intervention could be applied to the treatment group. The nature of the intervention was another limitation. The intervention was embedded in normal educational setting and not in the leisure context. The generalisability of the research findings has to be interpreted
with caution.

Although the participants participated in this study voluntarily, they were students from RPEP and thus their LEE, LEM, LEB, and LEBE might not be completely independent from other confounding variables. The participants in the intervention group only received intervention two hours each week, their daily activities such as attending classes, preparing for examinations etc. might act as confounding variables and would have affected the data collection. University workload might have overshadowed the intervention and caused the intervention to be ineffective.

The reliance on self-report of the LEE, LEM, LEB, and LEBE is another limitation. There was potential bias of the responses and they were subject to errors. The LTEQ asked the participants to recall their leisure exercise behaviours and thus incurred potential wrong memory recall of the number of hours they spent on each type of leisure exercises.

As the unequal sample size in treatment and control group may create problems in the factorial design, a random deletion of the number of participants was conducted. After deletion, 172 participants were left for data analysis; this constituted only 52% of the original sample size. The small sample did not permit the exploration of subscale differences in associations with the LEBE and selected
variables in the MUSLEB.

**Implications of Findings**

This study has contributed knowledge to the study of LEE, LEM, LEB, and LEBE of Hong Kong university students. Its findings have important implications for the researchers, curriculum planners, and policy makers in the following aspects.

Tenenbaum (1995) commented that the research studies in sport have been dominated by the quantitative statistical analysis methods. The adoption of both quantitative and qualitative research methodologies in the present study provides support for the use of both methods in one study. The quantitative research method identified and validated the conceptual dimensions of the selected variables on the LEBE and the intervention effect of the LEEI. The qualitative research method provided a broader and deeper understanding of the perceived LEB and the ways to increase the leisure exercise participation of university students. Its implication is that the employment of both research methods enabled a better understanding of the LEBE for university students.

In this study, LEE is found to be a significant predictor of LEM and an important determinant of LEBE. To facilitate the development of long term exercise efficacy and motives, it is critical that an individual is responsive to exercise and thus
enjoys and adheres to it. When designing programs or curriculums for university students, the planner should take note of this and find ways to attract students to participate voluntarily. Most research studies on exercise motives have the tendency to focus on competitive sport (Biddle & Mutrie, 2001). It is equally important for us to understand the reasons why students participate in leisure exercise. The differences in LEM represent different participation frequencies (Lindner & Speak, 1995). Although this intervention was not effective, it supported the importance of acquiring knowledge of exercise behaviours. It is thus desirable to incorporate leisure education into the primary and secondary school physical education curriculum to provide students with a positive attitude towards leisure exercise (Sivan, 2003).

There are many research challenges for physical educators who devote themselves to contributing to the knowledge base for the promotion of LEBE among university students. Benefits of leisure exercise are not restricted to physical benefits, but also include psychological benefits (King, Valerius, & Collins, 1998). New scientific discoveries are critical to enhance the effectiveness of interventions. The concept of habit has been widely investigated in social and cognitive psychology (Iso-Ahola & St. Clair, 2000). Result findings from this study suggest that university students need to develop better habits to exercise during their leisure-time. The finding is in agreement with earlier observations of Valois, Shephard, and Godin.
(1986) who suggested that habit is a strong predictor of exercise behaviours. An important implication is that the role that habit plays must be examined and interventions must be tailor-made to change the existing behaviours of university students in terms of more leisure exercise. Hong Kong people should be educated on the importance of leisure exercise in their early childhood.

The leisure exercise level of Hong Kong school children is lagging behind their counter-parts in other countries. The cultural background of Hong Kong is considered to play an important role in this phenomenon. Hong Kong does not have a developed sport culture and students are sedentary (Fu, 1993; Tsai, 2002). Lack of exercise may lead to health problems and may be associated with chronic disease such as coronary heart disease and obesity (National Center for Chronic Disease Prevention and Health Promotion, 2004). This raises concerns for students’ physical and psychological development — an impact for the future health of the whole society (Hong Kong Sports Development Board, 2003). In light of this, this study has suggested nine activities that could be used to improve the LEBE of the university students of Hong Kong (see Chapter 6, pp. 160-163). The suggested activities provide insights and encourage physical education and leisure studies professionals to consider them. An important implication may be the promotional effort of the university students’ LEBE should not be restricted to the educational settings, but
should extend to the community at large. The Hong Kong Government should consider organising promotional campaigns to encourage Hong Kong citizens to engage in leisure exercises and maintain a healthy and active lifestyle.

**Recommendations for Future Research**

Very few research studies were conducted to study the role of the environment on university students’ LEBE. According to Pender (1998), environmental factors include options (facilities, equipment), aesthetics (safe, pleasant), and demand characteristics (environmental dictates for specific behaviours) of the surroundings. This study demonstrated that the awareness of an environmental factor — culture, is crucial in developing an intervention to modify the exercise behaviours of Hong Kong university students. Future research is needed to better understand the role of culture in the model of university students’ LEBE. There should be more cross-cultural research conducted on the differences of exercise behaviours in different countries (Biddle, 1995).

The two measuring scales newly developed for this study — the LEES and the LEBQ, have only been applied to Hong Kong students in the sample. It is recommended to use the two scales on Chinese students in Mainland China or Taiwan in future research studies so that comparisons can be made among different
regions. The subscales of the LEES, LEBQ, and MPAM-R were not used in this study for data analysis. Future research studies on similar areas should employ the questionnaires and analyse the results with the subscales. This allows the detection of more subscale differences across different categories of participants.

The re-specified model of the MUSLEB indicated that LEE, LEM, and LEB accounted for only 8% of the total variance in LEBE. This finding suggests that the determinants of LEBE may be multiple, particularly in an Asian culture. As the hypothesized model was developed according to western oriented literature, only a small amount of variance could be accounted for. In future, more variables should be added to the model to re-examine the path models of the Hong Kong university students’ LEBE.

The lack of sensitivity of the measures to small or moderate changes in level of exercise behaviours may be one of the reasons why the intervention was not effective (Pender, 1998). The results may also suggest that the dimensions of the intervention were not vigorously implemented. Further studies would be needed to identify the reasons.

The problems in assessing the exercise level of the studied sample should not be under-estimated (Biddle & Mutrie, 2001). In the present study, only the recall technique of leisure exercise level was used to determine the leisure exercise level
and the data collected might be biased and create problems for data analysis. For more reliable results, it is desirable to have variations in data collection techniques. Physiological indicators, such as heart rate monitors or movement sensors may be considered for other similar small-scale research.

As Bandura’s SCT (1986) suggests that there is a reciprocal relationship between determinants and exercise behaviours, future studies may consider studying LEE, LEM, LEB, and LEBE in a bi-directional way. It is recommended to replicate this study in various settings (other universities and other regions) and other populations (secondary school, primary school, and kindergarten) so that findings can be compared.

**Conclusions**

In conclusion, this study has provided significant information on the LEBE of Hong Kong university students. Despite the limitations mentioned above, the present study demonstrates that longitudinal research in the domain of leisure exercise and physical education is desirable in the following ways:

1) The obtained results can be used for cross-cultural comparison.

2) It has developed and validated the culture-specific LEES and LEBQ (see Chapters 4 & 5).
3) The testing of the MUSLEB enables researchers to be aware of the relationships among the selected predictors on LEBE for the Hong Kong university students (see Chapter 5).

4) The role that the environment — culture plays in affecting university students’ LEBE can be regarded as a pilot study on investigating the LEBE of the Hong Kong university students (see Chapter 6).

5) The present study adopted quantitative data analyses to provide basic research evidence to the investigation and qualitative data analyses to facilitate better understanding of the study with examples. It demonstrates that both quantitative and qualitative methods are important scientific tools (see Chapter 6).

6) This study has proposed many practical suggestions to improve the LEBE of Hong Kong university students (see Chapter 6).

It must be noted that the present study is exploratory in nature and more future effort is needed to help clarify the research questions. The contribution of this study may be limited primarily to the field of physical education and leisure exercise, but hopefully the information can inspire others to conduct more research in the future.


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Appendix A

Consent Form

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Appendix B

Leisure Exercise Efficacy Scale (LEES)

(Ng, Cuddihy, & Fung, 2003a)

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Appendix C

Leisure Exercise Barrier Questionnaire (LEBQ)

(Ng, Cuddihy, & Fung, 2003b)

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Appendix D

Motivation for Physical Activities Measure-Revised (MPAM-R)

(Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997)

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Appendix E

Leisure-Time Exercise Questionnaire (LTEQ)

(Godin & Shephard, 1985)

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