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# Social cognitive theory based physical activity intervention targeting non-working time physical activity of workers with intellectual disabilities

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# Social Cognitive Theory Based Physical Activity Intervention Targeting Non-Working Time Physical Activity of Workers with Intellectual Disabilities

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# SOCIAL COGNITIVE THEORY BASED PHYSICAL ACTIVITY INTERVENTION TARGETING NON-WORKING TIME PHYSICAL ACTIVITY OF WORKERS WITH INTELLECTUAL DISABILITIES

**CHAN SUET YING**

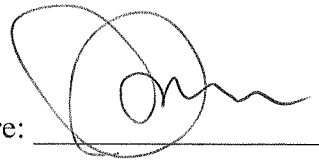
**Ph. D. Thesis**

**HONG KONG BAPTIST UNIVERSITY**

**2014**

## DECLARATION

I hereby declare that this thesis represents my own work which has been done after registration for the degree of PhD at Hong Kong Baptist University, and has not been previously included in a thesis, dissertation submitted to this or other institution for a degree, diploma or other qualification.

Signature: 

Date: March 2014

## ABSTRACT

The purpose of the study was to evaluate the effects of a Social Cognitive Theory (SCT) based physical activity intervention designed to evaluate the effectiveness of the twelve-week intervention with regard to psychosocial behaviour using SCT and physical activity behaviour among adults with intellectual disability in non-working time.

Design: The study involved pre-post randomized control trial and employed a MANCOVA analysis for this study. Between-Subjects Design was used to assess the effect of independent variable (twelve-week intervention programme) on two groups (intervention group and control group). Follow-up (separate ANVOAs) were calculated on the four dependent variables (self-efficacy, outcome expectancy, barrier to exercise, and moderate physical activity).

Participants: Eighty participants from St. James settlements aged over 18 years participated in the present study. After data screening, 59 (30 males, 29 females; n for intervention=29, n for control=30) cases with completed data were analyzed. The final data set contained participants with age ranged from 21 to 67 years (M=35.83, SD=10.28) and BMI ranged from 13 to 64 (M=27, SD=7.33). Intervention group received a SCT-based intervention programme for twelve one-hour lectures.

Outcome measures: The Primary outcomes included Self-efficacy, Outcome expectation and Barrier to exercise Questionnaire (SOBQ) on psychosocial behaviour (self-efficacy, outcome expectancy and perceived barrier) and Physical Activity Recall (PAR) on physical activity behaviour (moderate physical activity) among adults with intellectual disabilities. Secondary outcome include objective check list to evaluate the designed treatment being delivered to participants adequately. Measures were taken at baseline and posttest and additionally, intervention group were recruited for follow-up at 4-month.

Results: After controlling the pretest scores, the MANCOVA results showed a statistically significant difference between two groups (intervention group and control group) $F(4,48)=32.8$, $P<0.001$; Wilk's Lambda=0.27, partial eta squared =0.73. Result of follow-up measure on MANCOVA, showed that 12-wk intervention between-subjects are significant for all 4 dependents variables: self-efficacy: $F(1,116)=47.12$, $p<0.0125$, $\eta\rho^2=0.48$; outcome expectation: $F(1,134)=22.27$, $p<0.0125$, $\eta\rho^2=0.30$; barrier to exercise: $F(1,100)=10.50$, $p<0.0125$, $\eta\rho^2=0.17$; moderate physical activity $F(1,114)=96.79$, $p<0.0125$, $\eta\rho^2=0.65$ with a Bonferroni adjusted alpha level of 0.0125.

The MANOVA results showed that the outcome of the 12-week intervention programme significantly influence time (pretest and posttest) of self-efficacy, outcome expectation, barrier to exercise, moderate physical activity. All scores are significantly higher for posttest in self-efficacy ($p<0.01$), outcome expectation ($p<0.01$), moderate physical activity ($p<0.01$), and lower in barrier to exercise ($p<0.01$).

Lastly, the four months follow-up test showed that the intervention group had significantly lower mean scores compared with posttest in self-efficacy, outcome expectancy, and barrier to exercise. There was no significant difference in moderate physical activity between follow-up and posttest in the intervention group.

Conclusions: The twelve-week SCT-based educational treatment shows significant effects in posttest and also intervention group on the targeted constructs: self-efficacy, outcome expectation, and barrier to exercise as well as increasing the moderate physical activity among working adults with intellectual disabilities.

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| | |
|---|---|
| AAHD | American Association on Health and Disability |
| BIQ | Baseline Interview Questionnaire |
| CDC | The Centre for Disease Control and Prevention |
| HA | Healthy Athletes |
| HHPRP | Health and Health Promotion Research Projects, |
| HL | Healthy Lifestyles programme |
| HLCP | The Healthy Lifestyle Change Programme |
| ID | Intellectual Disabilities |
| M | Mean |
| MPA | Moderate Physical Activity |
| MR | Mental Retardation |
| PA | Physical Activity |
| PAR | Physical Activity Recall |
| PDPAR | Previous-Day Physical Activity Recall |
| PLPA | Paths to Leisure Physical Activity among Adults with Intellectual Disabilities |
| SCT | Social Cognitive Theory |
| SD | Standard Deviation |
| SOBQ | Self-efficacy, Outcome Expectation and Barrier to Exercise Questionnaire |
| SOC | Stage of change |
| WHO | The World Health Organization |
| YRBS | Youth Risk Behavior Survey |

# CHAPTER 1

# INTRODUCTION

## Physical Activity and Health Problem

Lack of physical activity was one of the major risk factors influencing health; it was associated with higher risk of diseases such as heart diseases, high blood pressure, diabetes, and colon cancer (Centers for Disease Control, 2008). The World Health Organization (WHO) (2004) reported that sedentary lifestyle may lead to chronic diseases that represent 60% of all deaths in the world including heart disease, stroke, cancer, chronic respiratory diseases, and diabetes. Mokdad et al. (2003) reported that in long term, consequences of physical inactivity, overweight and obesity were significantly related to diabetes, high blood pressure, and poor health status.

Apart from higher risk of diseases, lack of physical activity may also affect mortality. In Western Europe and the United States, the overall life expectancy at birth was 74.0 to 76.5 years and life expectancy at 65 years was 81.7 to 82.7 years in 2000 (Hoyert, Kochanek, & Murphy, 2002). In contrast, individuals with mild or moderate intellectual disabilities (ID) in the U.S. had an average life expectancy of 45 with average age of death at 66.1 years (Eyman, Grossman, Chaney, & Call, 1993; Janicki, Dalton, Henderson, & Davidson, 1999). Compared with individuals without ID, those with mild or moderate ID were more likely to have age-related health conditions. Bartlo (2011) stated that functional declines associated with advanced aging in the general population had been found to occur at younger age in adults with ID, and the life expectancy of individuals with ID decreased with increased severity of ID.

The promotion of physical activity among people with ID was important to help alleviate the risks of chronic diseases and overweight and obesity related diseases (U.S. Department of Health and Human Services, 2000), because the prevalence of obesity among adults with disabilities tends to be more severe than the able-bodied. Research

findings showed that prevalence of obesity in adults with ID was greater than that found in the general population which ranges from 11.7% to 26.5% in men with ID compared to 3.9% to 23.1% of men in the general population, and the prevalence of obesity of women with ID was 23.1% to 58.5%, compared to 3.9% to 28% of women in the general population (Hamilton, Hankey, Miller, Boyle, & Melville, 2007). The prevalence of obesity was more pronounced in terms of gender differences among adults with ID (Rimmer, Chen, McCubbin, Drum, & Peterson, 2010; Stancliffe et al., 2011). Persons with ID show a considerable lack of physical fitness as well as very low levels of cardiovascular endurance when compared to people without ID (Lotan, Isakov, Kessel, & Merrick, 2004).

## Physical Activity Recommendations

The Centre for Disease Control and Prevention (CDC, 2008) recommended that adults aged 18-65 should engage in moderate-intensity physical activity for at least 30 minutes or more on 5 or more days of the week, or vigorous-intensity physical activity 3 or more days per week for 20 or more minutes. Physical activity can be accumulated in shorter bouts of ten-minute durations to have health benefits, and was recommended to accumulate at least 60 minutes of daily PA. This accumulation of physical activity was recommended by U.S. Department of Health and Human Services (2000) whose purpose was to promote health and prevent illnesses, disabilities, and premature deaths in the Healthy People 2010 document. Tudor and Bassett (2004) also indicated that if the sedentary adults could accumulate thirty minutes of walking per day (or the equivalent energy expenditure in other activities), they would receive significant health benefits. They emphasized that sedentary population could have any kind of physical activity like occupational, nonoccupational; or tasks of daily living such as brisk walking, cycling, swimming, home repair, and yardwork (Tudor-Locke &

Bassett, 2004). In Healthy People 2010, the document also recognized that any type or amount of physical activity can provide important health benefits (U.S. Department of Health and Human Services, 2000), it also recommended that physical activity should include goals and objectives which were to encourage physical activity and make fitness became part of the regular healthy behaviour. Warburton, Nicol, and Bredin (2006) stated that there was incontrovertible evidence that regular physical activity contributed to the primary and secondary prevention of several chronic diseases and was associated with a reduced risk of premature death. Warburton et al. (2006) demonstrated through their data that there was a linear relationship between the volume of physical activity and health status that most physically active people were at the lowest risk. The improvement in health status can be seen even when people were least fit to become physically active. They also explained that health promotion programming should target people with all ages to reduce the risk of chronic disease which increases with age (Warburton et al., 2006). The recommendation of Warburton et al. (2006), ACSM (Haskell et al., 2007), and CDC (2008) showed a clear relationship between physical activity and health.

**Physical Activity Participation of Individuals with Intellectual Disabilities**

Compared with the general population, individuals with ID had a lower rate of physical activity. Only 15% of adults with ID engaged in regular physical activity of thirty minutes per day and 40% in leisure physical activity (U.S. Department of Health and Human Services, 2000). Individuals with ID were unlikely to participate in physical activities, either due to lack of the motivation or the chance to be involved in fitness programmes (Rimmer & Yamaki, 2006). Cummins and Lau (2003) investigated the leisure activities of 207 adults with ID living at home in Dublin, Ireland. They found that most individuals with ID aged 15-64 took part in sedentary

activities, such as watching television (73.4%) and listening to the radio or recorders (41.1%). In the U.K., Martin and Sinden (2001) conducted a health screening study of 120 individuals with ID living in the community. They found that 48.2% of their sample engaged in some physical activity over the previous four weeks compared with 93.5% in the general population. This suggests that the lifestyles of individuals with ID were mostly sedentary.

Research findings had consistently shown that individuals with ID had lower cardiovascular fitness levels compared with those in the general population (Pitetti & Tan, 1991). On the other hand, people with ID were more likely to have higher risk in cardiovascular diseases (Beange, Lennox, & Parmenter, 1999; Fernhall, 1993; Fernhall et al., 1998; Fernall 1998; Lancioni & O'Reilly, 1998; Rimmer et al., 2010). Besides, Draheim et al. (2002) found that individuals with ID who were overweight or had abdominal obesity were 3 to 10 times more likely to have cardiovascular disease than those who were not overweight or had no abdominal obesity (Draheim, Williams, & McCubbin, 2002).

Despite many research findings have revealed the benefits and importance of regular activity, adults with ID could not achieve the recommended activity level of at least thirty minutes moderate intensity activity per day (Frey, 2004) or walk 10,000 steps/day (Croteau, 2004). Walking is a primary activity of people with ID and is a typical example for moderate physical activity as low-risk activity for people with ID (Bassett, Mahar, Rowe, & Morrow, 2008). For healthy adults, 10,000 steps per day is a reasonable goal (Tudor-Locke & Bassett, 2004). However, only 21.4% of adults with ID reached 10,000 steps/day (Stanish, 2005). Research findings showed that only one third or fewer of adults with ID were sufficiently active to meet the various health promotion guidelines for physical activity and to achieve health benefits (Temple, Frey, & Stanish, 2006). The present study targeted moderate physical activity like walking

as it was reported to have low risk for people with ID (Bassett, Mahar, Rowe, & Morrow, 2008).

## Worker with Intellectual Disabilities in Hong Kong

In Hong Kong (Hong Kong Special Administrative Region Government, 2008), there were 62,000 to 87,000 people considered as mentally handicapped, 50% of which were regarded as overweight (BMI >23) and about 29% of which were obese (BMI >25) (Hong Kong Special Administrative Region Government, 2008). This showed that around 80% of the mentally handicapped population was not in a healthy zone, being either overweight or obese with associated risk of chronic disease, mortality and premature death. These data signified the importance of promoting a physical activity programme for adults with ID in Hong Kong to increase their physical activity participation so as to help promoting healthy behaviour.

In terms of employment opportunity, the Hong Kong Government provides employment services for the intellectually disabled aged 15 or above with day training or vocational rehabilitation service, like sheltered workshop, on-job training programme, day-activity centre, integrated vocational rehabilitation services centre, integrated vocational training centre (day service), and supported employment. There were 20,600 workers with disability in Hong Kong (HKSAR, 2008), and the job nature in day training or vocational rehabilitation was usually a sitting job that may reinforce sedentary lifestyle for people working there (Social Welfare Department, 2008). According to Department of Health and Human Service, people with ID were at risk of lower rate of physical activity because of the sedentary life style (U.S. Department of Health and Human Services, 2000); those workers with ID in worksite have higher obesity rate with the risk of chronic disease, mortality and premature death (Bartlo, 2011; Draheim et al., 2002). Study on physical activity promotion

programme is needed to evaluate the effect of PA intervention among this special population.

**Barriers on Physical Activity among Adults with ID in Worksite**

People with ID have similar health promotion needs as those without disabilities; however, adults with ID may face difficulties in greater degree when participating in physical activity, which may reinforce them to become physically inactive. According to King et al. (1998), worksite programmes were often less attractive to those sedentary or less-educated employees, only interventions that were tailored to these persons' needs and interests showed promise (King et al. 1988). While in special population, Rimmer (1996) claimed that one of the barriers among ID was the perception about themselves not able to exercise because of their disabilities (Rimmer, 1996). Compared with able-people, there were many difficulties faced by ID and with greater degree (Bodde, 2009; Finlay & Lyons, 2001; Messent, Cooke, & Long, 1999; Rimmer, 1996; Rimmer, Heller, Wang, & Valerio, 2004; Sutherland, Couch, & Iacono, 2002), and most of the studies were from Western countries. OneSearch engine from Hong Kong Baptist University library was used to retrieve studies date till 2012 with these keywords: Hong Kong, intellectual disabilities, physical activity, intervention, sheltered workshop. Two studies were retrieved but were deemed irrelevant for the present study design because the research design involved psychiatric rehabilitation and parenting distress. Interventions to promote physical activity for adults with ID in Hong Kong worksite were largely absent from the literature, exploration on what elements were required for physical activity programmes at work to be effective for increasing physical activity levels among workers with ID, or maintain PA levels over time were needed. Since no study had been conducted in Hong Kong on PA intervention programme among adults workers

with ID, there was a need to have a better understanding of the effectiveness of intervention programme for working adults with ID in Hong Kong. The present intervention programme contents were tailored to adults with ID working in day training center.

## Overview of Intervention Literature

Many of the interventions on health promotion programme among adults with ID have been demonstrated to have a positive impact on exercise adherence and maintenance. However, most of the intervention programmes were focused on physical fitness such as cardiovascular fitness, muscle strength, balance, or caretaker's rate of physical activity in day training or vocational rehabilitation center with little focus on behavioral changes toward physical activity among adults with ID in worksite. Bartlo and Klein (2011) suggested that research in intervention programme needed to be practical and adaptable to the need of individuals with ID. The uniqueness of the present intervention programme was implementation of psychosocial behaviour towards physical activity among adults with ID with a focus on those working in a day training center in Hong Kong.

### Psychosocial Behaviour and Physical Activity

There was correlation between psychosocial behaviour and physical activity, according to Sallis et al. (2000), who had reviewed a number of articles on the correlates of physical activity (Sallis, Prochaska, & Taylor, 2000), four categories: the demographic and biologic factors, social and cultural factors, behavioral attributes and skills, and psychological cognitive and emotional factors were identified as important correlates of physical activity. Sallis et al. (2000) reported that outcome expectations were found to have a positive relationship with physical activity in 3 of 7 articles

reviewed; self-efficacy in 7 of 13 articles reviewed and concluded that there was a consistent relationship. It appears that social cognitive correlates had been found with significant impact on physical activity; and the constructs, self-efficacy and outcome expectations were promising targets for interventions to change physical activity behaviour.

When reviewing the literature on physical activity interventions on adults with ID, factors leading to low levels of fitness in persons with ID included a passive life style (Lotan et al., 2004), low motivation as well as psychological and physiological factors (Bodde & Seo, 2009; Fernhall & Tymeson, 1988). Similar to general population (Sallis et al., 2000), Heller (2004) arrived at the same conclusion with Sallis et al. (2000) that variables of social, psychological, and environmental constructs could influence physical activity in special population; while modifiable variables: self-efficacy, outcome expectations and barrier to exercise had been consistently associated with physical activity (Heller, Hsieh, & Rimmer, 2004). It confirmed that psychosocial behaviour correlated with physical activity and effective interventions should have these variables that appear to modify behaviour.

Apart from this, the literature also showed that Social Cognitive Theory (SCT) was the most widely used theoretic foundation for many intervention efforts. Pastorfield (2005) suggested that programmes need to be based on sound and tested theory such as the Transtheoretical Model and SCT that can offer a framework for structuring activities for participants and coaches to learn the process of modifying or changing health behaviours and improving one's self-confidence to change his or her behaviour. Pastorfield (2005) also suggested that the duration of curriculum or intervention programme should be long enough of twelve-week duration for participants to learn.

Research showed that self-efficacy, outcome expectations and barriers to exercise

related to the SCT that have an impact on physical activity. SCT was used in the present intervention programme including self efficacy, outcome expectations and barriers to exercise which were the most widely targeted theoretic construct.

## Social Cognitive Theory (SCT)

Social Cognitive Theory (SCT) model was developed by Bandura in 1986. Originally developed as a psychological theory, the SCT model had wide implications in numerous fields, especially in laying the foundation for physical activity promotion programmes ( Bazzano et al., 2009; Heller, Hsieh, & Rimmer, 2004; Heller, Marks, & Sisirak, 2006; Pastorfield, 2005; Peterson et al., 2008; Sallis et al., 1999). Social Cognitive Theory (SCT) was used as the model to describe the development of human behaviours as a result of triad reciprocal relationship of SCT variables with the complex flux of human behaviour, personal factors, and the environment (Bandura, 1986). Bandura (1986) identified the triadic reciprocal concept in SCT which describes the mutual action between all of the causal factors of human behavior.

A central tenet of social cognitive theory is the concept of self-efficacy. A person must believe in his or her capability to perform the behaviour and must perceive an incentive to do so. Additionally, a person must value the outcomes or consequences that he or she believes would occur as a result of performing a specific behaviour or action. Outcome expectations may be classified as having immediate benefits or long term benefits. Barriers are involved in barriers-based self-efficacy in social cognitive theory that stresses the impact of barriers on one's confidence or ability (Bandura, 1986). For the purposes of this study, barriers to exercise was used and extended from barriers-based self-efficacy as a variable, not only because it was important variable in SCT, but it altered personal behaviour and was core and widely used by most other theories such as The Health Belief Model (Becker et al., 1979), Trans-theoretical

Model (Reed, Velicer, Prochaska, Rossi, & Marcus, 1997), Social Problem-solving Theory (D'Zurilla & Nezu, 2001) and Theory of Planned Behaviour (McCauley & Franklin, 1998; Montano, Kasprzyk, & Taplin, 2002).

**Modifiable Determinants**

The present intervention programme was designed to increase physical activity levels for adults with ID and evaluate the effectiveness of the intervention programme in Hong Kong worksite. Thirteen intervention studies with psychology and ID were retrieved, five studies were found to be related with the present study. Studies reported the intervention programmes had modifiable determinants on personal factors in physical activity among adults with ID, and studies also showed that self-efficacy had been consistently and positively associated with physical activity among adults with ID (Abdullah et al., 2004; Bazzano et al. 2009; Heller, Marks, & Sisirak, 2006; Pastorfield, 2005; Peterson et al. 2008), and four out of five reviews also supported the conclusion that outcome expectations were consistently and positively associated with physical activity (Bazzano et al. 2009; Heller, Marks, & Sisirak, 2006; Pastorfield, 2005; Peterson et al. 2008). Besides, four out of five reviews on the construct of barriers to physical activity had reported negative association with physical activity among adults with ID (Bazzano et al. 2009; Heller, Marks, & Sisirak, 2006; Pastorfield, 2005; Peterson et al. 2008). The present study used the constructs from the SCT, namely, self-efficacy, outcome expectations and barriers to exercise in intervention programme, which was believed to have effective impact on the intervention programme among adults with ID in Hong Kong worksite.

## Statement of the Problem

Lack of physical activity may have higher risk of developing chronic, obesity related disease and mortality (Bartlo & Klein, 2011; Butler & Dwyer, 2004; Crouter, Schneider, Karabulut, & Bassett, 2003; Thomas & Williams, 2006). Adults with ID were not achieving the recommended activity level both in overseas countries (Croteau, 2004; Frey, 2004) and in Hong Kong (Chan, 2010b; Graham & Reid, 2000; Yen & Lin, 2010). With 20,600 of workers with disability in Hong Kong (HKSAR, 2008), to the knowledge of the present investigator, there was no research on intervention programmes on promoting physical activity in worksite for adults with ID in Hong Kong. Besides, adults with ID face more barriers when participating in physical activity compared with able individuals (Rimmer, 1996). Therefore, an effective and feasible way to promote physical activity in worksite among this special population was needed (Bartlo, Klein, 2011; U.S. Department of Health and Human Services, 2000; King, Carl, et al. 1998).

## Purpose of study

The purpose of the study was to evaluate the effects of a twelve-week SCT-based intervention programme with contents designed with the constructs of self-efficacy, outcome expectations, and barriers to exercise to increase the psychosocial behaviour (self-efficacy, outcome expectations, and barriers to exercise) and physical behaviour (moderate physical activity during non-working time) among adults with ID recruited from a in worksite. Four months of follow-up test was conducted to evaluate the short team adherence of the SCT-based intervention programme on intervention participants.

## Research Questions

This study addressed one research question with five hypotheses.

Were the posttest scores of psychosocial and physical activity variables in the intervention group statistically different from the control group while controlling for the pretest scores, age and BMI on the four measures?

## Study Hypotheses

There were four dependent variables included: psychosocial behaviour (self-efficacy, outcome expectation, barrier to exercise) and physical activity behaviour (moderate physical activity). The present study hypotheses were:

1. The posttest scores would be significantly higher in the intervention group than the control group while controlling for their scores on the pretes, age and BMI t.
2. The posttest scores on self-efficacy would be significantly higher in the intervention group than in the control group.
3. The posttest scores on outcome expectation would be significantly higher in the intervention group than in the control group.
4. The posttest scores on barrier to exercise would be significantly lower in the intervention group than in the control group.
5. The posttest scores on moderate physical activity would be significantly higher in the intervention group than in the control group.

## Significance of the Study

Many evidence suggested that physical activity provides benefits to people with mental disabilities (Fogarty, Happell, & Pinkahaha, 2004), yet adults with ID did not reach the recommended guideline for physical activity (CDC, 2008). Bartlo and Klein (2011) recommended further research of PA programmes that are adaptable to the need of ID to be important for this special population.

There was no SCT-based PA intervention programme to promote healthy behaviour among adults with ID in Hong Kong worksite. Findings from the reviews showed that Social Cognitive Theory is the most widely used theoretic foundation (Abdullah et al., 2004; Bazzano et al., 2009; Heller, Marks, & Sisirak, 2006; Pastorfield, 2005; Peterson et al., 2008); and self-efficacy, outcome expectation and barrier to exercise have been widely used theoretic constructs for interventions among ID (Bartlo & Klein, 2011; Heller, McCubbin, Drum & Peterson, 2011 Hutzler & Korsensky, 2010).

In the present study, self-efficacy, outcome expectancies, and barrier to exercise, were viewed as the basis of the constructs, because these variables have been identified to have a strong relationship with physical activity in the literature, relevant to the study and they were modifiable. To enhance physically activity for adults with ID in worksite, a twelve-week intervention programme was designed with a four-week follow-up test on short term adherence of the SCT-based intervention programme. Participants in intervention group were encouraged to reach the recommended activity level of 10,000 steps/day (Stanish, 2005) with the pre-set goal as process measure on each lesson and they attended a tailored-made lesson in one-hour per week; while participants in the control group did not attend any lessons or took step goal assessments and they worked as usual in the same worksite as the participants in the intervention group.

## Definition of terms

For the purpose of the present study, the following terms were operationally defined.

**Worker**

Workers were adults with ID who graduated from secondary schools and were at

age 18 or above, working in the sheltered workshops or adapted workplace environment.

**Intellectual Disability**

Mental Disability, mentally handicapped, mental deficiency, mental retardation, cognitive impairment, intellectual disability, learning disability had been used in the literature. In Hong Kong, the Committee on Home-School Co-operation 2007-2008 (Committee on Home-School Co-operation, 2008) indicated that the word “mentally handicapped” was normally used among special schools in Hong Kong. In the U.S., the organization, “the Association of Medical Officers of American Institutions for Idiotic and Feebleminded Persons” established in 1876 had changed its name to "American Association of Mental Deficiency" and then to "American Association of Mental Retardation." In June 2006, members of the association voted to change its name yet again to "American Association of Intellectual and Developmental Disabilities". Intellectual disability was the currently preferred term for disability historically referred to as mental retardation (American Association on Intellectual and Development Disabilities 2007, 2007). However, those terms that had been used in researches before June 2006 and had the same meaning with intellectual disability remains unchanged. “Mental disability” was a disability characterized by significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social and practical adaptive skills and this disability emerges before the age of 18 (American Association on Intellectual and Developmental disabilities (2002). The definition of “intellectual disabilities” here was mild grade (Intelligent Quotient (I.Q.) 50-55 to approximately 70) and moderate grade (I.Q 35-40 to 50-55). Severe grade or profound grades were excluded in the present study.

**Social Cognitive Theory (SCT)**

SCT was a psychological theory of human behavior postulating that personal, behavioral, and environmental forces shape human behavior actively in reciprocal and dynamic relationships (Bandura, 1986).

**Physical Activity**

Physical activity was defined as any bodily movement that was produced by the contraction of skeletal muscle and that substantially increases energy expenditure (Caspersen, Powell, & Christenson, 1985).

**Activity Intensity Level Guideline**

According to the latest American Heart Association and the American College of Sports Medicine ACSM (Haskell et al., 2007) joint guidelines on physical activity, adults aged 18-65 should be getting at least thirty minutes of moderate intensity activity five days a week to achieve health benefits.

**Moderate Physical Activity**

The Centre for Disease Control and Prevention (CDC, 2008) recommended that adults should engage in moderate-intensity physical activity for at least 30 minutes or more on 5 or more days of the week; or at least ten minutes of intermittent or shorter bouts of activity (Tudor-Locke & Bassett 2004). In this study, in order to promote days of PA among adults with ID, the goal for the targeted sample was to participate 30 minutes in a maximum of five days in a week (Monday to Friday) and within that 30 minutes, participants must be engaged in at least fifteen minutes continuously as a bout of moderate physical activity (Winters, 2001).

**Pedometer**

Pedometer is a small device, worn on the body, which measures steps of distance. In this study, Yamax SW 700, a model of pedometer (Yamax, Japan) was used as a device that counts and records each step a person makes. It was sealed and worn on the waist (Stanish, 2004). In this study, the goal for the targeted sample was to participate in a minimum of 10,000 steps per day (Croteau, 2004).

**Self-efficacy**

In SCT, Bandura (1986) defined self-efficacy as "people's judgment of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p.391).

**Outcome Expectation**

In SCT (Bandura, 1986), outcome expectation was "a judgment of the likely consequence such behaviour will produce" (Bandura, 1986, p.391).

**Perceived Barrier**

In SCT (Bandura, 1986), perceived barrier was a person's confidence in overcoming barriers to that behavior, and all behavioral changes were mediated by self-efficacy which was a common cognitive mechanism (Bandura, 1986).

## Delimitations

The delimitations of this study were summarized as the following statements:

1. The participants were limited to those under the scheme of the Hong Kong worksites on Training and Employment for People with Disabilities.
2. Chinese workers of intellectual disabilities were studied. Those participants who

were studying at schools were excluded.

3. The participants were of age 18 or above, including adults living in and out of the family home. Both male and female workers with intellectual disabilities of one sheltered workshop were selected for the sample.
4. Participants of the study were adults with intellectual disabilities and those with physical disabilities were excluded.
5. Participants of the study were adults with mild to moderate intellectual disabilities and those in severe or/and profound grade were excluded.
6. The participants had no regular exercise habits.
7. The participants in the intervention group needed to be enrolled in a Social Cognitive Theory based physical activity intervention programme, which had one session per week for twelve weeks and was delivered by the investigator in this study. Both parents and subjects had to provide informed consent. Participants had to attend 80% of classes during the intervention time frame.
8. The study involved the Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ) (Heller et al., 2004) to evaluate the psychosocial behavior among the adults with intellectual disabilities. Physical activity participation was assessed by the Physical Activity Recall (PAR) (Cheung,2006; Hortz, 2005; Weston et al., 1997).
9. The study used pedometer (Yamax SW 700, Japan) to measure intellectually disabled adult's physical activity in terms of number of steps taken daily. In order to avoid reactivity to the instrument (pedometer), participants were provided with a sealed pedometer for the test. Participants were asked to wear a pedometer during waking hours everyday except shower and swimming, and records were taken by the administrators twice a day. Pedometers were used as process measure to record the physical activity level within the twelve-week intervention

so as to ensure the participants in the intervention group could reach a step goal of 10,000/day by week 12 (Croteau, 2004).

## Limitations

There were several limitations that should be considered when interpreting the results of this research:

1. The results of the study were limited by the validity and reliability of the pedometer, Yamax SW 700 as well as SOBQ and PAR.
2. The duration of the SCT-based physical activity intervention programme was limited to twelve weeks in which the intervention group had to attend a one-hour lesson per week.
3. The location of the test was limited to one Hong Kong worksite of training and employment centre for people with intellectual disabilities.
4. Only intervention group was recruited for the 4-month follow-up test after the 12-week intervention programme.
5. It was not possible to collect data on weekends; data collections on physical activity were conducted on five consecutive weekdays only (Monday to Friday).

# CHAPTER 2

# LITERATURE REVIEW

This chapter provides an in-depth review of the literature relevant to the topics of physical activity among adults with ID in Hong Kong worksite. The first section included background of ID in Hong Kong and the physical activity level. The second section of the chapter consisted of reviews pertaining determinants of physical activity for adults with ID, which included physical / environmental and psychosocial. This section served as a base for the present intervention development. The third section was a review of the Social Cognitive Theory, the constructs on self-efficacy, outcome expectations, barrier to exercise were discussed. This review also included discussions of the measurement methods used to assess physical activity in the fourth section. The information contained in this review served as a foundation in which the intervention programme was developed.

## Background of Intellectual Disabilities in Hong Kong

Ordinances concerning people with disability (PWD) were scattered in various chapters of the Laws of Hong Kong but there was no comprehensive and unified ordinance covering all areas of disability legislation. The landmark ordinance for the disabled was the Disability Discrimination Ordinance (DDO), which had become effective since 1996. According to the DDO, a person with disability was someone who had a total or partial loss of bodily or mental functions, total or partial loss of a part of the body, illness or disease that affects a person's perception of reality, the presence of organisms causing disease or illness (such as HIV), the malfunction, malformation or disfigurement of a part of the person's body, or a disorder, emotions or judgment or that results in disturbed behaviour, and learning difficulties (Disability Discrimination Ordinance, 1998).

According to a report titled “Persons with Disabilities and Chronic Illnesses” conducted by the Census and Statistics Department in 2000 (Hong Kong: Census and Statistics Department, 2000), there were 344,000 persons with disabilities, representing 5% of the total population of Hong Kong (6,800,000) (Census and Statistic Department HKSAR, 2000). The estimated populations of different disabilities groups were: 18,500 persons with speech impairment, 73,900 persons with visual impairment, 69,800 persons with hearing impairment, 50,500 persons with mental illness, 103,500 persons with physical handicap, 3,000 persons with autism and 74,500 persons with mental handicap. By February 2009 (Hong Kong: Census and Statistics Department, 2009), the numbers of new registrants of disabilities were 361,300 persons who had one or more of the following types of disabilities: 92,200 persons with hearing difficulty, 122,600 persons with seeing difficulty, 28,400 persons with speech difficulty, 86,600 persons with mental illness or mood disorder and 3,800 persons with autism (Hong Kong: Census and Statistics Department, 2009). There was an increased number of disabilities people reported by Census and Statistic Department HKSAR from 2000 to 2009 in Hong Kong, and these data underestimated the populations of persons with ID, as the household survey was conducted on a voluntary reporting basis (Hong Kong: Census and Statistics Department, 2008). A crude statistical assessment indicated that the total number of persons with intellectual disabilities in Hong Kong was likely to be in the region of 67,000 to 87,000, representing 1.0% to 1.3% of persons with intellectual disabilities in Hong Kong (Hong Kong: Census and Statistics Department, 2009).

There were an estimated 20,600 of workers with disability in Hong Kong (HKSAR, 2008), with an estimate of 5,500 people with ID who were economically active (Hong Kong: Census and Statistics Department, 2008) that earned income from their job. Data showed that among the 5,500 economically active adults with ID,

majority of them engaged in the community, social and personal services sector (>92%) and majority of them were working in sheltered workshops (Hong Kong had 35 sheltered settlements, 6 on the Hong Kong Island, 13 in Kowloon, and 16 in the New Territories). Although the data were considered to be under-estimated figures, they have provided some lower-bound estimates of the number of persons with ID and it could still serve to provide some crude indication of the demographic and socio-economic characteristics of the persons with ID in Hong Kong that there were number of adults with ID worker in Hong Kong and majority of them were working in the sheltered workshops. Past studies showed that physical activity habit of persons with disabilities were at the forefront of the sedentary (American Academy of Orthopaedic Surgeons, 2007). Health educators were concerned that the increased sedentary behaviours among people with ID may result in increased levels of physical inactivity, increased obesity and reduced levels of physical fitness, which were factors that may be harmful to health in the long term with increased risk in diabetes and cardiovascular diseases (Bartlo & Klein, 2011; Crouter, Schneider, Karabulut, & Bassett, 2003; Draheim, Williams, & McCubbin, 2002; Faulkner, 2005). The present intervention study targeted sheltered workshop and explored the PA level among adults with ID.

## Physical Activity Level in Hong Kong

Findings had consistently shown that the amount of physical activity of people in Hong Kong was not enough. The results from Cardiovascular Risk Factor Prevalence Study (Janus, 1995-1996) involving nearly 8000 participants between age 25 and 74 showed that more than 57% of men and 61% of women in Hong Kong did no sport or exercise over a one-month period. Middle-aged people were the least active while the youngest age groups, particularly men, were most likely to exercise. Besides, Adab

and Macfarlan (1998) stated that 59% of all adults in Hong Kong had a fairly sedentary lifestyle and only one in three exercised at levels that were thought to have significant health benefits. The relationships were similar to those in the U.S. data, which showed that, nearly two out of three adults (60 percent) did not have enough leisure time physical activities to benefit their health (Centers of Disease Control and Prevention, National Center for Chronic Disease Prevent and Health Promotion, 2005).

The participation rates among people with ID were low (Cummins & Lau, 2003; Martin & Sinden, 2001; Rimmer & Yamaki, 2006; U.S. Department of Health and Human Services, 2000). Draheim, Williams, and McCubbin (2002) reported that overall, men and women (adults with mental retardation) who resided in community settings were inactive, with 47% to 51% of the individuals participating in little to no leisure time physical activities, 42% to 47% of them reported participation in moderate to vigorous leisure time physical activities five or more times per week. Compared with the Asia region, data showed that participants in Taiwan had slightly lower PA rate than the Western with only 39.5% of individuals ID had regular exercise, and among these individuals, more than 50% took less than three exercise times per week (Yen & Lin, 2010). Findings in an earlier Hong Kong study from Fu (1996) also showed that 44% of the subjects with disability interviewed did not participate in any physical activity, and for the rest of 56% who claimed to participate in physical activity, they only engaged in 6.8 hours per month in home exercise, 3.1 hours per month in exercise class and less than 0.5 hours per month in other activities such as cycling, playing table tennis, basketball, and football (Fu, 1996). The studies from Yen (2010) in Taiwan and Fu (1996) in Hong Kong showed that individuals with disabilities in Asia spent most of the time on sedentary activities and the PA behaviour of adults with ID was not reaching the CDC's recommendation of 30 minutes of MPA

on 5 or more days per week. Although the PA rates among ID were slightly different between western and eastern cities, the situation in Hong Kong was similar, that individuals with ID spent most of the time on sedentary activities (Chan, 2010b; Graham & Reid, 2000; Yen & Lin, 2010). The consequences of an inactive lifestyle were more serious for people with ID than for the general population because inactivity exacerbates the limitations of a disabling condition (U.S. Department of Health and Human Services, 2000).

## Determinants of Physical Activity for Adults with Intellectual Disabilities

Most of the adults with ID were not participating in recommended amount of PA. Sedentary lifestyle increases the risk of obesity and chronic diseases, therefore, it is important to understand the determinants of PA for adults with ID in order to develop and implement an effective and adaptable intervention programme. The purpose of this section was to review the determinants of physical activity for adults with ID, which was divided into two parts: physical / environmental and psychosocial. This section served as bases for the curriculum development of the present intervention study.

### Physical / Environmental Determinants

Frey, Buchanan, and Sandt (2005) examined physical activity behavior in adults with ID by focusing on participant perspectives. They found that adults with ID faced many of the same barriers to physical activity as those people without disabilities, such as job/life concerns, money, weather, time, safety, transportation, and health concerns/injuries. Researchers claimed that adults with or without ID might face similar barriers on physical activity, but the context was likely to be different due to unique factors associated with the condition in adults with ID (Messent, Cooke, &

Long, 1999; Sutherland, Couch, & Iacono, 2002); whereas, Bodde (2009) claimed that adults with ID with lack of volitional control almost had no control over their environment and had few opportunities to be physically active. There was a need to remove the barriers for people with ID to participate in physical activity. Rimmer et al. (2004) revealed that there were 178 barriers and 130 facilitators to PA. The following major themes about barriers and facilitators were identified: (1) body built and natural environment; (2) economic issues; (3) emotional and psychological barriers; (4) equipment barriers; (5) barriers related to the use and interpretation of guidelines, codes, regulations, and laws; (6) information-related barriers; (7) professional knowledge, education, and training issues; (8) perceptions and attitudes of persons who were not disabled, including professionals; (9) policies and procedures both at the facility and community level; and (10) availability of resources (Rimmer, Heller, Wang, & Valerio, 2004). An earlier study conducted by Rimmer (1996) stated that the reasons of the disabled remaining inactive include the perception by some individuals that they were not able to exercise as a result of their disabilities, limited access to transportation to and from the exercise site, inaccessible facilities and equipment, and a lack of knowledge concerning the importance of exercise to healthy living. Sutherland et al. (2002) and Messent et al. (1999) investigated barriers to physical activity specifically in adults with ID and with care providers. Both studies found that barriers primarily identified by care providers included (a) unclear policy guidelines about activities; (b) financial constraints, including personal resources, transportation, and staffing; (c) limited geographical access to physical activity opportunities; and (d) limited options for community physical activity. Finlay and Lyons (2001) suggested that adults with ID had few opportunities for physical activity, little environmental control, and frustration with a lack of leisure choices. Although these findings were reliant on care providers who might not accurately represent the primary-source's

perceptions, they still clearly reflected that adults with ID face barriers in participating physical activity. In general, barriers and facilitators to PA are the combination of personal, social and environmental factors that determine PA behaviour. Nevertheless, Bodde (2009) conducted a systematic research review to analyze the barriers to PA for adults with ID. Bodde (2009) included original research articles published after 1980 with primary intention of identifying PA determinants of adults aged 18 or above with ID. Out of the 837 results, seven studies were relevant to adults with intellectual disabilities and intention of identifying PA determinants. He concluded that transportation issues, financial limitations and lack of awareness of options were barriers repeatedly occurred throughout the analyzed studies (Bodde, 2009).

To summarize, most of the determinants of physical activity for adults with ID were on economic issues, transportation, and the health concern/injuries. It was clear that intervention programmes should help minimize transportation, financial, and health educational barriers to enhance PA level among adults with ID.

Unlike able-adults, people with disabilities may have less volition and face many special difficulties when participating in physical activity, which may be impeded by their incidences of secondary complications such as coronary heart disease, hypertension and obesity. All of these conditions or barriers limit a person's ability to interact with the environment. In the current proposed study, physical activity intervention programme with one-hour lesson per week was conducted in worksite, which helped to enhance learning among workers with ID. In terms of the transportation and financial issues, walking was a prime mode of PA programme for people with ID because it was well accepted and it does not cost money. Moreover, walking may also substitute transportation within reasonable distance and it is gentle on the body with minimal risk of injury (Belza et al., 2004; Michael, Green, & Farquhar, 2006). With such a study design, it was hoped that these determinants

(transportation, financial, and educational barriers) of physical activity for adults with ID would not be a barrier anymore and the programme may help encourage and promote physical activity among adults with ID.

**Psychosocial Determinants**

This section reviewed Social Cognitive Theory studies that measured self efficacy, outcome expectations and barrier to exercise in adults with ID. The review focused on psychosocial variables that interventions used to alter behaviours among adults with ID, these variables were reviewed as the basis of the constructs to be addressed in this study; while the content on intervention programmes served as a basis on intervention and curriculum design in present study.

With the limitation on intervention studies in Hong Kong, the first section, review was based on U.S. studies by systematic review related to the topic on the determinants of physical activity among adults with ID, while the second section was based on exercise intervention studies targeted on large scale health promotion program at the U.S. with state and community level, and the last section was summary.

Heller, McCubbin, Drum and Peterson (2011) conducted a review of studies on physical activity and nutrition health promotion interventions for people with intellectual disabilities. The purpose of the review was to indicate some evidence for fitness and psychosocial benefits of community-based physical activity and exercise programmes for adults with ID. Searches included MEDLINE, PsycINFO, and CINAHL databases from 1986 through July 2006. Out of 4,078, 11 articles were deemed relevant by scoping review method. Bartlo and Klein (2011) also conducted a systematic review of physical activity benefits and needs in adults with intellectual disabilities. The purpose of the review was to assess the evidence on effectiveness of PA interventions for adults with ID. Searches included CINAHL, Pubmed,

Sportdiscus, and the Cochrane Controlled Trials between 1990 to 2010. Out of 1990, 11 articles were deemed relevant by 10-point Physiotherapy Evidence Database Scale. On the other hand, Hutzler and Korsensky (2010) conducted a systematic review on motivational correlates of physical activity in persons with an ID. The purpose of the review was to examine and discuss scientific studies focusing on motivational correlates that both contribute to, and can be assumed to be effects of participation in sport, recreation, or health-related PA in persons with ID. Searches included Sportdiscus, Medline, PsychINFO and Cochrane library from 1980 through 2009. Twenty-three studies were retrieved by Oxford Center for Evidence-based Medicine, Strength of Recommendation Taxonomy, Cochrane Library Scale and Physiotherapy Evidence Database.

From the reviewed studies, Hutzler and Korsensky (2010) found that most of the intervention programmes were focus on care-taker or parents of person with ID. In the categories of intervention design, out of 23, only eight studies with a total number of 371 (150 female and 221 male) participants were retrieved. Five studies addressed children and adolescents and three studies included young, middle aged and older adults. Level of disability was mild to moderate, and participants in four studies were recruited from Special Olympic (SO) frameworks and the others were from local community and educational programmes.

Among 11 articles, Heller, McCubbin, Drum and Peterson (2011) found that physical activity were identified as component related to health promotion programmes, and the outcomes measures in majority of the articles were improved fitness (balance, strength, aerobic capacity), weight reduction (lower BMI), fewer maladaptive behaviour, reduced functional decline expected with aging, better attitudes toward exercise (self-efficacy, expected outcome, cognitive-social barriers)

and improved life satisfaction for persons with ID. Bartlo and Klein (2011) also found the similar result that aerobic training, resistance training and balance training were the major outcome measures throughout the reviewed studies, and they all demonstrated positive outcomes on physical fitness, strength, functional mobility and quality of life. Bartlo and Klein (2011) stated that most intervention programmes were focused on physical fitness such as cardiovascular fitness, muscle strength and balance etc. but there was a lack of research on health behaviour change and attitudes towards exercise. On the other hand, the reviews from Hutzler and Korsensky (2010) showed that improved physical fitness and elevated skill level gained during exercise and sport related physical activities appear to serve as mediators for increased perceptions of self-efficacy and social competence, which was in line with Heller (2011) that health promotion programme could improve attitudes toward exercise. When reviewing motivational correlates of physical activity in persons with ID, Hutzler and Korsensky (2010) found that most studies measured self-perception of perceived competence, social acceptance for assessing motivational correlates, self-concept, self-esteem, self-efficacy, and well-being.

In Heller al et. (2011), only three out of 11 studies from the review had control group in study design which limiting the validity of the findings in most of the studies. None of the reviewed studies indicated that intervention programmes could be implemented over long period of time, only one study had short-term four week follow-up measure and none demonstrated behavioral change that led to long-term improvement in health outcomes; where Hutzler and Korsensky (2010) found that most of the reviewed studies on aerobic workload and muscular strength were measured prior to, immediately after and following a 6-month period. Bartlo and Klein (2011) suggested that positive influence on intervention programme was shown in the length of the programme from six to twelve weeks. Authors also suggested that

research in this area needed to be translated into practice and specifically the development of physical activity programmes should be adaptable to the need of individuals with ID, while Heller al et. (2011) suggested that randomized control study for longer term follow-up adherence over time was needed

In Heller al et. (2011), authors concluded that health behaviour education curricula such as Heller's Exercise and Nutrition Health Education Curriculum for Adults with Developmental Disabilities and Mann's Steps to your Health geared to adults with ID showed promise and could improve the health of people with ID; while Hutzler and Korsensky (2010) agreed that an example of well-planned and properly conducted study was Heller et al. (2004). Assessment in this study was performed using a battery of instruments measuring motivational correlates of PA including: barriers to exercise, attitude towards exercise, exercise knowledge, confidence to perform exercise social environmental support, depression, and life satisfaction.

Heller al et. (2011) suggested that objectively assessed PA such as pedometers and accelerometer or direct observation could be used in future study. Bartlo and Klein (2011) from the review found that most of the aerobic exercise programmes in the studies used walking as the mode of exercise and concluded that walking was an easy mode of exercise due to low cognitive training needs and cost effective and should be considered for adults with ID. Bartlo and Klein (2011) also suggested that an easily accessible and familiar environment for individual with ID were important elements to enhance the sustainability of the development of physical activity programme (Bartlo & Klein, 2011).

Within the studies review, Hutzler and Korsensky (2010) found that most frequently cited theories in developing health-related exercise motivation were Bandura's Social Cognitive Theory (SCT) and Prochaska's Transtheoretical Model (TTM). Among these studies, SCT structured the theoretical frame for an intervention

study in SO events and Heller's 12-week exercise and health education programme on adults with ID. Major concepts within SCT such as perceptions of social support and self-efficacy were found to be mediators of participation in a community-based sports group. TTM was another theoretical framework extensively used in health-related behaviour programme, Heller (2004) used TTM and SCT as theories to explore adherence of persons with ID to enhanced levels of PA. Hutzler and Korsensky (2010) concluded that Bandura's SCT was the most frequent theoretical constructs for designing research and explaining results of intervention programme. Based on the SCT, external positive reinforcement like winning ribbon and medals in personal factors was important to motivate people with ID in PA; while in environmental factors, social support, family support in younger ID and social support of staff in older ID and social support of peers was significantly correlated with self-efficacy and correlated with participation (Hutzler & Korsensky, 2010).

With the limitation on intervention studies in Hong Kong, review in this section was based on exercise intervention studies targeted on large scale health promotion program in the U.S. at state and community levels, and the contents of intervention programmes of physical activity among adults with ID served as a basis of intervention and curriculum development in present study.

The following contains descriptions of health promotion programmes targeted for adults with ID based on SCT (Bandura, 1986). OneSearch engine, included over one million items, including books, journal articles, conference proceedings, audio/visual media, dissertations, reports, and other research resources in subscription journals and databases from Hong Kong Baptist University library, was used to retrieve studies within 2004-2010 with the following keywords: health program, social cognitive theory, adults, ID, exercise intervention, community-based, self-efficacy, outcome

expectation, barrier. Eighty-five studies were retrieved with 13 studies included psychology and ID. Only five studies were found to be suitable for a review in the present study; the remainders were deemed irrelevant for the present study design because the research design involved variables such as depression, anger, psychiatric service or staff attitudes, and participants were focused on autism and physically disabled. Studies selected for an in-depth review that were developed for adults with ID included: Health and Health Promotion Research Projects (Heller, Marks, & Sisirak, 2006), Paths to Leisure Physical Activity among Adults with Intellectual Disabilities (Peterson et al., 2008), The Healthy Lifestyle Change Programme (Bazzano et al., 2009), Healthy Athletes (Pastorfield, 2005), and Healthy Lifestyles (Abdullah et al., 2004).

Health and Health Promotion Research Project (HHPRP) was a centre-based fitness intervention conducted by Heller, Marks, and Sisirak, (2006) using pre- and post-test research design. The purpose of the study was to determine what elements, if any, would increase in terms of physiological and psychosocial health. Participants (N=53) with Down's syndrome aged 30 years and older with mild to moderate ID completed the pre- and post-assessments. The intervention group contained 32 participants who completed a 12-week exercise and health education programme. Twenty-one participants in the control group received no training. In comparison to the control group, participants in the intervention group reported a decrease in barriers to exercise, improvement in their attitude toward exercise, confidence to perform exercise immediately after training ($p < .001$) and at 6 months ($p < .05$). Heller et al. reported that women had significantly greater BMIs than men. Intervention group improved in all outcome measures for cardiovascular fitness, body composition, and strength, whereas the control group showed a slight improvement or decline or no change. The exercise programme also had a small but significant effect on reducing

body weight, but there was no gender difference. Although process evaluation was not described, Heller et al. reported that adults with Down's syndrome could understand health behaviour education, and the duration, twelve-week exercise and health education programme was suitable for the people with ID.

Paths to Leisure Physical Activity among Adults with Intellectual Disabilities (PLPA) was a cross-sectional design by Peterson et al. (2008). PLPA consisted of a Social Cognitive Theory based programme aimed to test a path model that includes perceptions of social support and self-efficacy for leisure physical activity participation among adults with ID. Data were collected by oral interview with a community-based group and supported-living settings. Sample comprised 152 adults with mild to moderate ID, which yielded a 39% response rate. Self-reported scales were used to assess self-efficacy and social support (from family, residential staff and peers with disabilities) for leisure physical activity. A self-report checklist of the frequency of leisure physical activity participation was used as measurement. Peterson et al. (2008) reported that the hypothesised model fit the data from each group. Self-efficacy was a mediator between social support and physical activity, both of which predicted physical activity participation, and it was found that there was a striking difference between age groups. For the elderly, social support from staff and peers was important, whereas the youth needed family support in predicting physical activity. No process evaluation or physiological impact was performed.

The Healthy Lifestyle Change Program (HLCP) was a community-based project with single group intervention design and a pre- and posttest evaluation upon Social Cognitive Theory conducted by Bazzano et al. (2009). Eligible participants included 431 community-dwelling adults with developmental disabilities. Almost all participants had some degrees of ID, either mental retardation (68%) or conditions similar to mental retardation (25%), aged 18–65 years, who were overweight/obese

(BMI >25) with another risk factor for diabetes or metabolic syndrome or who had a diagnosis of diabetes. With a pretest-posttest design, using participants as their own controls, a delayed intervention (DI) comparison group design was selected and implemented with one cohort of participants at a time. Participants were divided into two groups after completing baseline measures, namely the intervention group and the DI group. The HLCP was a seven-month, twice-weekly educational and exercise program to increase self-efficacy regarding health, fitness, skills, knowledge and nutrition among adults with developmental disabilities. Peer mentors were both participant leaders and primary motivators. After a seven-month intervention, bivariate analyses were used to examine differences between pre- and post-assessments. Evaluation of the intervention included construct validity of the treatment and behavioral evaluations and physiological impact. Construct validity of the treatment evaluation indicated that significant improvements in self-efficacy. Over half (59%) of participants showed improvements in life satisfaction. Behavioral evaluation indicated that the intervention had a significant impact with 61% of the participants reported increased physical activity. Mean exercise frequency increased from 3.2 times to 3.9 times per week ($p$= 0.01). Mean exercise duration increases from 133 minutes to 206.4 minutes per week ($p$=0.02). Physiological impact of intervention with two thirds of participants maintained or lost weight, with a mean weight loss of 2.6 pounds and a median weight loss of 7 lbs (range: 2-24 lbs). Average BMI decreased by 0.5 $kg/m^2$ ($p$= 0.04). Abdominal girth decreases in 74% of participants (mean=-1.9 inches).

Healthy Athletes (HA) (Pastorfield, 2005) programme focused on community-based interventions based on the Trans-theoretical Model of Behaviour Change and Bandura's Social Cognitive Theory that included improved self-confidence, perceived health, decreased barriers to exercising, more positive attitudes toward exercise, increased fibre intake, and reduced body weight. The

curricular intervention and comparison group consisted of Special Olympic (SO) athletes participating in four of the six pilot sites (N = 56) of whom the mean age was 32 (SD=11.3), with pretest and posttest design in eight weeks. The evaluation process focused on health status and health behaviours among SO athletes, programme satisfaction among coaches and SO athletes, and process and structural variables associated with implementation of health promotion programmes within SO. In terms of athletes' view of physical activity and their supports for being physically active, results showed improved perceptions, reduced barriers and enhanced supports for physical activity toward physical activity. Data also revealed decreased barriers, enhanced attitudes toward physical activity, increased fiber intake, and improved self-confidence. Physiological evaluation indicated that different domains including reduction in body weight, in waist to hip means, upper body, lower body muscle strength, endurance, aerobic fitness and improved perceived health. Process implementation evaluation indicated that small group discussions were needed to make a personal connection. Some directors thought that it might be better to have verbal reminder and description about the programme and to keep it simple and start small, and one director thought that a twelve-week programme allowed coaches to teach the curriculum over a longer period and enhance athletes' ability to learn concepts related to health and fitness.

Healthy Lifestyles programme (HL) was a community-based health promotion programme for people with a variety of disabilities and with varied levels of health (Abdullah et al., 2004). The purpose of the study was to improve health behaviours and health-related attitudes and to promote health among people with disabilities. The study participants (N=162) with the mean age of 47 were recruited in the communities. The treatment consisted of ten free 2½-day workshops by monthly support groups for six to nine months. Support groups met for two hours each month. The workshop

focused on the connections among physical, social, emotional, and spiritual health, and health through activities. Assessment of the curricular objectives was done through the use of Health-Promoting Lifestyle Profile (HPLP II) which consisted of 52 items that measures health-promoting behaviours in the domains of nutrition, physical activity, interpersonal relations, spiritual growth, health responsibility, and stress management. Items were scored on a four-point scale indicating how often respondents engaged in specific behaviors or had certain feelings: never, sometimes, often, or routinely, with Cronbach's alphas ranging from 0.79 to 0.94. Wilcoxon signed-ranks tests were used to identify significant differences between pre- and post-test scores for each group. Between baseline and six months following the workshop, workshop participants had a significant decrease in secondary conditions ($t=2.11$, $p=.038$). Also, participants had a significant decrease in the number of days in the past month during which they felt sad, blue, or depressed ($t= 2.21$, $p=.030$); a significant decrease in the number of days in the past month in which they felt worried, tense or anxious ($t=2.89$, $p=.005$); and a significant increase in the number of days in the past month in which they felt very healthy and full of energy ($t= -2.00$, $p=.049$). No process evaluation, physiological impact of intervention, or physical activity behavior change was conducted.

**Conclusion.** In reviewing the literature pertaining to adults with ID intervention targeting physical activity behaviour and psychosocial behaviour, the following conclusions were made. Social Cognitive Theory was the most widely used theoretic foundation for these interventions (Hutzler & Korsensky, 2010). The theoretic construct most widely targeted was self-efficacy (Abdullah et al., 2004; Bazzano et al., 2009; Heller, Marks, & Sisirak, 2006; Hutzler & Korsensky, 2010; Pastorfield, 2005; Peterson et al., 2008). Additional constructs targeted in some intervention studies consisted of outcome expectation and barrier. Despite the use of the theory, most

interventions did not do process evaluations (four out of five) or treatment behavioral impact (four out of five). Although the process evaluation was done by one intervention, the evaluation was comprehensive and valuable. On the other hand, there were many evaluations on treatment construct validation (four out of five). Heller's study (2004) was example of well-planned and properly conducted study (Heller, McCubbin, Drum & Peterson, 2011; Hutzler & Korsensky, 2010), which improved the health of people with ID, present study would used it as a basis of curriculum applied in Hong Kong. Among five of the studies, two used the baseline interview questionnaire (BIQ) as instrumentation on psychosocial measurement, which was found to be valid and reliable in measuring social-cognitive aspects of exercise adherence for adults with mild to moderate ID (two out of five). Thus, modified BIQ, selected sections of BIQ were chosen as the psychosocial instrument applied in the present study. Besides, the present study used randomized control group to enhance the validity and four-month follow-up test to measure a longer term adherence of intervention (Heller, McCubbin, Drum, & Peterson, 2011). Worksite was targeted in this study, because it was easy, accessible and familiar environment for adults with ID which could enhance the sustainability of the development of physical activity programme (Bartlo & Klein, 2011).

**Summary of exercise intervention contents.** Among the many constructs found in these interventions, self-efficacy was consistently used **(**Hutzler & Korsensky, 2010). Self-efficacy was also addressed in HHPRP, PLPA, HLCP, HA and HL. These interventions had the adults with ID engaged in physical activity in class to demonstrate skill and strengthen their belief in resisting negative feelings.

Outcome expectation was primarily addressed through intervention in HHPRP, PLPA, HLCP, and HA. Outcome expectancies were targeted through written goals,

and the action plan that participants developed to achieve these goals. PLPA included self-report checklist of the frequency of leisure physical activity participation. HLCP used self-determined healthy lifestyle plan, personal goals and strategies to accomplish their goal, handbook, reminder letter, role-play and small group activities, by which participants' outcome expectancies were addressed. HA utilized small group discussion, and HL had support groups met for two hours each month.

Barrier to exercise was also used in HHPRP, PLPA and HLCP as a construct. Within HHPRP, the barrier to exercise construct was targeted through exercising in a group setting, receiving reinforcement for their participation, reviewing videos of their own exercises, a peer trainer co-facilitating some of the classes, and working along with the research staff members. PLPA utilized support from family or peer and staff to participants' physical activity. HLCP provided free of charge assistance with transportation arrangement and interactive workshop with sharing and discussion. HA also provided transportation for participants in order to minimize barrier to the health promotion programme (See Table One).

**Summary of process evaluations.** Process evaluation was an evaluation component adopted in only one of the five interventions reviewed. Pastorfield (2005) provided a process implementation evaluation of the HA and concluded that the effectiveness of the intervention was based upon the small group discussions, keeping the programme more simple and starting small, getting people involved and interested at the local level. Having a personal trainer would also encourage participants to workout. With regard to the physical assessments, motivation strategies were used in the programmes so as to be more responsive to the needs of the participants with disabilities. Together with Heller et al. (2006) support in HHPRP, Bartlo (2011) and Pastorfield (2005) suggested that programme duration of twelve-weeks to produce the best outcomes, it would allow coaches to teach the curriculum over a longer period of

time and enhance athlete's ability to learn concepts related to health and fitness (See Table One). In this study, walking was used as a process measure, because walking was an easy mode of exercise with low cognitive training needs and being cost effective (Bartlo & Klein, 2011); therefore pedometer was used as a process measure for PA (Heller, McCubbin, Drum & Peterson, 2011) for adults with ID in the present study.

**Summary of construct validations of the treatment.** Evaluations of the effects of three constructs, namely self-efficacy, outcome expectation, and barrier to exercise were found in HHPRP, HA, HLCP, and HL**.** For HHPRP, the results indicated that both outcome expectations and self-efficacy toward exercise were improved immediately after training and maintained at six months after. Compared to the control group, participants in the intervention group reported a decrease in barriers to exercise immediately after training and six months after, while social-environmental support and life satisfaction in intervention group increases immediately after training. These results indicated that the targeted constructs were affected by the treatment HHPRP. In HA, the same changes were found in the constructs evaluated, which were self-efficacy, exercise perceptions, exercise support/barriers from participants at pre-posttest. The evaluation showed significant changes across different domains. In HL, all groups showed a statistically significant increase in their assessment mean scores from their pre-workshop Health-Promoting Lifestyle Profile questionnaires to their post-workshop questionnaires. The result indicated that the workshop and subsequent support groups had positive effect on the people who attended (See Table One).

**Summary of behavioral impact of intervention.** Change in physical activity

behaviour among adults with ID appears to be possible. Results of behavioral impact indicated in Health and Health Promotion Research Project (HHPRP) interventions showed that the participants had significantly more exercise behaviour at posttest than did the control treatment, with exercise increased by 14% immediately after the intervention and 13% six months later; where HLCP also showed an significant increase with 61% of participants reported to have physical activity (See Table One).

**Summary of physiologic impact of intervention.** According to Bartlo (2001), most of the intervention programmes were focused on physiologic aspect such as cardiovascular fitness, muscle strength and balance etc., further research should focus more on health behaviour change and attitudes towards exercise (Bartlo & Klein, 2011). On the other hand, results of impact indicated that two out of five interventions demonstrated an impact of physiologic variables. Although physiologic impact was not my focus in the present study, result still serves to provide some information about gender with ID. HHPRP (Heller, 2006) showed that there were no gender differences in physiologic results among intervention and control groups. Although women had significantly greater BMIs than men, both genders had a small but significant weight reduction.

**Summary of psychosocial measure of intervention.** Results of psychosocial measure of intervention indicated that two out of five interventions applied baseline interview questionnaire (BIQ) as the instrument to assess social-cognitive aspects of exercise adherence especially for adults with mild to moderate grade ID. In this population, the instruments had been considered reliable and useful to exercise adherence. The initial pre- and posttest analyses of these measures showed that they were valid and sensitive to changes in treatments. Test-retest reliabilities ranged

from .48 to .72 with alpha reliabilities from .66 to .91 (Heller, 2006). On the other hand, HHPRP (Heller, 2006) demonstrated intervention group had a decrease in barriers to exercise, and improvement in their attitude towards exercise immediately after training. In HA, (Pastorfield, 2005) the same measuring instruments (BIQ) were used and results demonstrated reduced barriers and enhanced supports for physical activity: self-efficacy, exercise perceptions, and exercise barriers were shown to have positive difference in pre- and post-test. Not all the study reported the reliability and validity of the measuring instrument, apart from HHPRP and HA, the result of the HLCP showed that instrument BMSLSS (See Table One) have high internal consistency with alpha reliability ranging from 0.79 to 0.94 and was proved applicable for people with disabilities. However, BMSLSS consists of 52 items that address a variety of topics such as nutrition, spiritual growth, interpersonal relations, and stress management, which were not the focus in the present study.

Table 1.

Summary of the Exercise Intervention using SCT: Adults with Mild to Moderate Grade of Intellectual Disabilities

| | Type of Intervention | | | | |
|---|---|---|---|---|---|
| Variables | (HHPRP)* 2006 | (PLPA)* 2008 | (HLCP)* 2009 | (HA)* 2005 | (HL)* 2004 |
| Intervention | 12-week | - | 7-month | 8-week | 6-9-month |
| Educational Intervention Contents | Self-efficacy<br>Outcome Expectation<br>Barrier to Exercise | Self-efficacy<br>Outcome Expectation<br>Barrier to Exercise | Self-efficacy<br>Outcome Expectation<br>Barrier to Exercise | Self-efficacy<br>Outcome Expectation<br>Barrier to Exercise | Self-efficacy |
| Process Evaluations | — | — | — | Small group discussions | — |
| Construct Validations | Yes | yes | yes | yes | Yes |
| Behavioral Impact | Yes | — | yes | — | — |
| Physiologic Impact | Yes | — | — | yes | — |
| Psychosocial Measure | yes<br>Baseline Interview Questionnaire (BIQ) | yes<br>Self-reported checklist | yes<br>Brief Multidimensional Students' Life Satisfaction Scale (BMSLSS) | yes<br>Baseline Interview Questionnaire (BIQ) | yes<br>Health-Promoting Lifestyle Profile (HPLPII) |

*Note: Health and Health Promotion Research Project (HHPRP), Paths to Leisure Physical Activity among Adults with Intellectual Disabilities (PLPA), The Healthy Lifestyle Change Program (HLCP), Healthy Athletes (HA), Healthy Lifestyles programme (HL).

## Social Cognitive Theory

This section review consisted of the Social Cognitive Theory, the constructs, self-efficacy, outcome expectations, and barrier to exercise. There were several concepts that could be included under SCT. For the purpose of the present study, only the variables of self-efficacy, outcome expectations, and barrier to exercise were chosen for this study, based on the significant relationship between these variables and physical activity adherence.

### Foundation of Social Cognitive Theory

Social Cognitive Theory (SCT), proposed by Bandura in 1986, was the most widely used foundation for physical activity promotion programmes (Abdullah et al., 2009.; Bazzano et al., 2009.; Heller, et al., 2006.; Hutzler & Korsensky, 2010.; Pastorfield, 2005.; Peterson et al., 2008). The SCT originated from the discipline of psychology that showed how people acquire and maintain certain behavioural patterns, and provided the foundation for intervention strategies. Human behaviour was explained in terms of a dynamic, triadic, and reciprocal model. Interactions of personal factors and environmental influences determine an individual's unique behaviour (Bandura, 1986) (See Figure One).

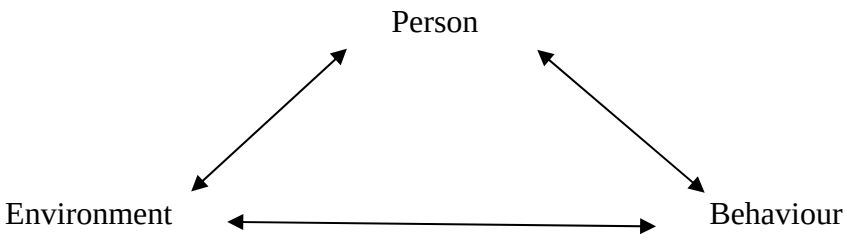


Figure 1. Diagram of Triadic Reciprocal Concept in SCT

In SCT, the nature of persons was defined within the perspective in terms of a number of basic capabilities, and the foundation of the theory on human capabilities were symbolizing, forethought, vicarious, self-regulatory, and self-reflective capabilities. Symbolizing capability was the capability that humans used symbols that provide meaning of altering and adapting behaviour to environment. Humans could process information in an environment by symbols and served as a model to guide future action. These symbols gave people meaning, form and continuance to the experiences they lived. Symbolizing allow people to generate new courses of action and determine which ways a behaviour should be engaged without suffering cost of missteps by estimating the outcome before action. People do not have to actually experiencing the misstep and determine the potential outcomes. This capability of rehearsal allowed people to create ideas and generate behaviour in different environment, times and contexts (Bandura, 1986). Forethought capability was the capability that humans anticipate the likely consequences of their prospective actions, people did not just react to environment or experience from their past, their behaviour was regulated by forethought purposively. Through forethought, people could motivate their behaviour based on their future anticipation. Even if the present conditions were not conductive to the behaviour, forethought could support fore-sightful behaviour, based on the way people's believe on that behaviour impact to the future expected event, it allows people to engage or not engage in that behaviour. This future anticipated action not only influences behaviour, but purposive behaviour (Bandura, 1986). Vicarious capability was the capability that learning through observing other's behaviour and its consequences. Learning could occur not just limited by performing responses and experiencing their effect, but can occur vicariously. By observation, people could learn from the actions of others and anticipated outcomes of that behaviour. This vicarious capability could allow people to

generate and regulate behaviour without a long and boring trial and error (Bandura, 1986). Self-regulatory was the capability to motivate and regulate behaviour by people's internal standard and self-evaluative action to their own actions. That behaviour was based on the adaptation, measurement and discrepancy of that personal standard and desires. Self-regulatory could direct our action called self-directedness that our behaviour could be changed and shaped to be better behaviour through influencing external environment. Self-reflective capability was the capability for reflective self-consciousness. People use their own thought processes to analyze their experience, and then generate that specific knowledge about themselves and the world around them. People can gain understanding through reflection, and also evaluate and change their own thinking. To quote Bandura "they monitor their ideas, act on them or predict occurrences from them, judge the adequacy of their thoughts from the results, and change them accordingly." (Bandura, 1986, pp.21)

To conclude, the uniqueness of SCT was the Triadic Reciprocality relationship between personal, environmental and behaviour. The foundation of SCT was human capability, which Bandura (1986) explained the nature of human behaviour was driven by these basic capability, such as symbolizing, forethought, vicarious, self-regulatory, and self-reflective capabilities (Bandura, 1986) and SCT serves as a model to describe the development of behavior as a result of these capabilities.

**Component of Social Cognitive Theory**

According to Bandura (1986), human behaviour was explained with triadic reciprocality in which behaviour, cognitive, personal factors and environmental events operate as interacting determinants of each other. In that case, psychosocial components were important in acquiring new behaviour. From Bandura (1986), self-efficacy was the key on learning new behaviour; while from the literature review,

findings showed that apart from self-efficacy, outcome expectations and barrier to exercise were also important in behavioral change. This section would define each psychosocial construct, for the purpose of the present study, only self-efficacy, outcome expectations, barrier to exercise were discussed.

**Personal Factors**

**Self-efficacy.** In SCT, Bandura (1986) viewed self-efficacy as one's belief in one's ability to succeed in specific situations that a person's judgment of his/her capability to organize and execute courses of action required to attain designated types of behaviours. Strength of self-efficacy was the belief in one's ability to overcome barriers to achieve certain desirable outcome (Bandura, 1986).

Bandura (1998) stated that individuals develop their self-efficacy by interpreting information primarily from four channels. The most powerful channel was mastery experiences. Experience mastery was the actual engagement in an activity followed by an interpretation of the results of their actions, which then in turn brought forth a belief in one's ability to execute such actions successfully in different situations in the future. Successful outcomes most likely raise self-efficacy while failures lower it. The second channel to develop self-efficacy was the vicarious experiences or observational learning. In the face of little prior experience with behaviour, people develop their beliefs based on their peers. When people were uncertain about their own abilities of a particular behaviour, they became more sensitive to those around them. This vicarious experience model was strong when the person modeling the behaviour was considered as sharing the similar or desired attributes as the observer. The third way was verbal persuasion. This was used to coax individuals into believing that they were able to take part in a desired behaviour even when they were actually incapable. A person can be verbally persuaded into believing that he/she can attain otherwise unreasonable

behaviours. Effective persuaders must be able to cultivate peoples' beliefs in their capabilities while at the same time ensuring that the envisioned success was attainable. The fourth way was through physiological and emotional states such as mood, anxiety and elation. Emotions can help a person determine the amount of efficacy for a given behaviour in a certain environment. Fear and anxiety effectively lower people's perception of successfully engaging in the behaviour. Bandura (1998) emphasized this emotional state because an individual had the ability to change their moods and if they change moods, they had the ability to change their behaviour too. Thus physiologic states and moods and thinking were forces driving each other (Bandura, 1986).

All of these modalities that derive self-efficacy may change a person's perceptions of their ability to engage in behaviour. Behavioral change programmes should direct learning experiences towards these four channels to increase one's self-efficacy.

**Outcome expectations and expectancies.** In SCT (Bandura, 1986), outcome expectations was the belief that a particular outcome would produce a specific outcome. Outcome expectancy value was the degree of probability perceived by a subject for some occurrence or aftermath resulting from behaviour and the value the subject had for that occurrence (Bandura, 1986). Outcome expectations and expectancies were closely tied together. Outcome expectations concern the probability of the outcome one expects from a behaviour. The expectancies were the value one had for the expected outcomes. Outcome expectations were related to healthy behaviours because these expectations directly affect a person's perception of different lifestyle habits that can be considered either healthy or unhealthy. Outcome expectations can be positive or negative: positive expectations can be incentives or reinforcements for a behaviour and negative expectations were disincentives for a

behaviour (Bandura, 1986).

There were three major forms of outcome expectations: physical, social and self evaluative (Bandura, 1986.; Bandura, 1994; Bandura, 1998; Bandura, 2001; Bandura, 2004; Bandura, 2005). Physical outcome expectation was the positive and negative physical states associated with a behaviour. Bandura (1986) delineates that there were physical pleasures and pleasant sensory experiences in the positive forms of expectation, physical discomfort and pain in the negative. The physical outcome expectations of certain behaviours can be powerful drives of behaviour while some can be powerful deterrents. For example, one may feel elated and thus willing to carry on when engaging in an optimal level of physical activity but once the activity gets strenuous one may feel out of breath and thus deterred. Whether the expectation was positive or not depends on the type of activity and the strenuousness of the activity. Social outcome expectation was the social reaction the behaviour brings forth. Behaviours serve as convenient examples where peer pressure can be observed to be powerful in shaping behaviour. In this context, if behaviour was considered socially positive, then the incentive to engage in the behaviour within that social network was strong; but when behaviour was frowned upon, the social sanctions of the group could be a powerful disincentive. Self-evaluative outcome expectation was the congruence of the above-mentioned behavioral outcomes and one's personal standard of behaviour. People tend to engage in behaviours that enhance self-worth or satisfaction, not behaviours that would make them feel unworthy or dissatisfied. An individual evaluates the expected outcome according to his/her own personal standard and then choose a behaviour to engage.

The final issue to be discussed regarding outcome expectancies was the values or expectancies that one had regarding the expected outcomes. An example of this would be a person who believes that engaging in strenuous physical activity can improve

his/her appearance. However, this person may still think the pleasure of watching television and eating junk food overwhelms that of having better physical appearance. Thus, he/she does not act on the expectation because another expectation had greater value to him/her. This was exactly what Bandura referred to as the multiplicative function between expectancy and expectation - the greater the two together the greater the drive was on behaviour (Bandura, 1986).

**Perceived barrier.** In SCT (Bandura, 1986), perceived barrier was barriers-based self-efficacy that a person's confidence in overcoming barriers to that behaviour, and all behavioural changes were mediated by self-efficacy which was a common cognitive mechanism (Bandura, 1986). For the purposes of the study, perceived barrier was used, extended and distinguished from self-efficacy in the present study, not only because it was important variable in SCT, it altered personal behaviour and was a core and widely used by most of the other theories.

The Health Belief Model (Becker et al., 1979) was one of the earliest to involve perceived barriers distinctively, and both barriers to and perceived benefits of behaviour conducive to an action were taken into account. In Health Belief Model, perceived barrier was someone's own thoughts about the obstacles in the way of adopting a new behaviour, and also the consequences of continuing an old behaviour (Becker et al., 1979). The perceived barrier was the most influential construct because it determined if someone would adopt a new behaviour or not, depending on if the benefits of the behaviour outweigh the consequences.

Apart from SCT, perceived barrier (as partial determinants of self-efficacy that stresses the impact of barriers on one's confidence or perceived ability) was also appeared in Social-ecological theory (Humpel, Owen, & Leslie, 2002; Stokols, 2000); that evaluation of barriers was commonly adopted for objective measures of

multi-level determinants of behaviour. Social-ecological theory conceptualized and broke down barriers into the proximal (e.g., family) to the intermediate (e.g., work-related, health care team) to the more distal (e.g., community access, regulatory policy, and media advertising) factors. In many goal attainment and self-regulation theories, perceived barrier was also important, though largely implicit (Leventhal, Leventhal, & Contrada, 1998; Locke & Latham, 2002). In these theories, goals were set and health behaviours were exercised in attempts to achieve these goals. Barriers and the perception and interpretation of barriers influenced both goal setting and attainment. Besides, barrier was used in Social problem-solving theory (D'Zurilla & Nezu, 2001), Social problem-solving theory also mentioned about self-management conceptual models such as the 5 A's: Assess – Advise - Agree upon goals - Assist with problem solving - Arrange follow-up support (Nagelkerk, Reick, & Meengs, 2006; Norris et al., 2002). These theories identified specific barriers to self management, followed by construction and implementation of barrier-related problem solving skills (D'Zurilla & Nezu, 2001; Glasgow, Toobert, & Gillette, 2001; Hill-Briggs, 2003). Barrier was the core of many theories of health behaviour, according to the Theory of Planned Behaviour (McCauley & Franklin, 1998; Montano, Kasprzyk, & Taplin, 2002), instead of related to self-efficacy, perceived barriers were conceptually distinct from, but related to the concept of perceived power. Moreover, "Barrier" was used by the Trans-theoretical Model (Reed, Velicer, Prochaska, Rossi, & Marcus, 1997) but "barrier" was renamed as "temptation" and questions phrased as "how tempted were you in different situations?". To conclude, barrier was core in many health behaviour theories, and in SCT, perceived barrier stressed the impact of barriers on person's confidence in overcoming barrier. The judgment on the degree of difficulty could alter specific health behaviour, which was exactly the triadic reciprocal concept in SCT (Bandura, 1986).

**Environment**

Apart from personal factor, Bandura (1986) defined environment as all the external physical structures that modify behaviour. Physical structures such as school, homes, etc, can also be environmental factors. A social dimension to the environment also included relationships such as family and friends. This construct was defined strictly on the absence or presence of these from the physical environment, while the perception or evaluation of the environment was defined as personal psychosocial factors. The acquisition of behaviour relied heavily on the environment, which must be supportive up to a point that it was conducive to the behaviour (Bandura, 1986). Environmental supports must be in place so that a person can acquire or can be helped to acquire a new behaviour. As the intellectually disabled individuals have very little volition to change their environment, environmental factors are particularly important in the SCT. One-hour lecture in classroom was provided in sheltered workshop in the present study.

**Behaviour**

According to Bandura (1986), human behaviour is explained by triadic and reciprocality in which behaviour, personal factors, and environmental events operate as interacting determinants of each other. In acquiring new behaviour, modifiable determinants of adult physical activity include personal and environmental factors. In terms of psychosocial components, self-efficacy has been consistently and positively associated with adults with ID in PA (Abdullah et al., 2004; Bartlo & Klein, 2011; Bazzano et al. 2009; Heller, Hsieh, & Rimmer, 2004; Heller, Marks, & Sisirak, 2006; Heller, McCubbin, Drum & Peterson, 2011; Hutzler & Korsensky, 2010; Pastorfield, 2005; Peterson et al. 2008). Besides, reviews also support the conclusion that outcome expectations have been associated with PA among adults with ID (Bartlo & Klein,

2011; Bazzano et al. 2009; Heller, Marks, & Sisirak, 2006; Heller, McCubbin, Drum & Peterson, 2011; Hutzler & Korsensky, 2010; Pastorfield, 2005; Peterson et al. 2008). Conversely, the construct of barriers to PA has been negatively associated with adults with ID in PA (Bazzano et al. 2009; Heller, Marks, & Sisirak, 2006; Hutzler & Korsensky, 2010; Pastorfield, 2005; Peterson et al. 2008).

## Measurement of Physical Activity

This section review included discussions of the measurement methods used to assess physical activity. The information contained in this review served as a foundation in which the intervention programme was developed.

There are numerous field methods in assessing physical activity, which can be classified into: (1) direct observation method, (2) energy expenditure, (3) activity monitor, (4) fitness measures and (5) self-report. Dishman, Washburn, and Schoeller (2006) stated that the criteria for valid methods of assessment should be reliable, unobtrusive, and practical to the administrator. They admitted that no single method fully meets the criteria. The selection of physical activity assessment method thus depends on the research problem and the constraints of the study, such as budget, sample size, setting, and time (Dishman, Washburn, & Schoeller, 2006). There are strengths and weaknesses in the measurement methods based on the Physical Activity Assessments for Health-Related Research (Welk, 2002), which were addressed as follows.

### Direct Observation Method

Direct observation is a method that involves the development of an instrument that a trained individual can use to record what activities another person engages in. A

person's intensity, duration, frequency, and type of activity can be directly observed and noted inform of qualitative and/or quantitative data. The advantage of this method is the targeting on more than one individual within a particular environment. The disadvantage of this method is time consuming and expensive on measurement technique and training, observer interaction effects, and limited report on validity and reliability for these measures (Welk, 2002).

**Energy Expenditure**

Many researchers have used energy expenditure as a proxy measure on the amount of physical activity in which a person engages in. The larger the amount of activity, the greater is the amount of energy expenditure. This can be measured by heat, gas, doubly labeled water, or heart-rate monitoring. Besides energy expenditure, there are also other activity monitors for the measurement of physical activity, which were summarized as follows.

**Activity Monitors**

Activity monitors (such as Caltrac, Tri-trac, CSA etc.) are common devices which an individual can wear on the body so that his/her motions can be recorded. A device can be worn on the hip to record the amount of motion or acceleration of a person within specific time intervals and it can be recorded, downloaded, computerized and evaluated. The advantages of such devices are the easily downloadable and analyzable data, the ability to capture the acceleration of the body, being a non-invasive means of quantifying the amount of activity, and providing data in segments of minute or hour format (Welk, 2002). The weaknesses of these methods are a lack of accurate cut points for estimating free-living activity, expensive, inaccuracy for many kinds of activity, and the inability to ensure the subject wearing

the monitor or wearing it properly over an extended period of time (Welk, 2002). Some devices stated that they provided information about the energy expenditure, duration, frequency, and intensity of physical activity, yet these devices did not provide the information on type and dimensions of activity, there was also paucity of research on the validity and reliability of the energy expenditure estimation procedures (Melanson, Freedson, & Blair, 1996).

Pedometer is another common device which is worn on the waist for recording step counts in a given period of time. Distance covered and energy expenditure can be estimated by multiplying stride length and step counts. The advantages of pedometer are the accurate estimation of step counts, low cost, easy to wear, and the usability in daily living situations (Bartlo & Klein, 2011.; Welk, 2002). The disadvantages of the pedometer are: they do not measure all kinds of activity and energy expenditure and was accurate only for walking activities; they cannot tell the frequency, duration, intensity, and dimensions of physical activity (Welk, 2002). Besides, pedometers do not detect slow walking and generally underestimate the step counts during higher intensity activities (Pitetti, Beets, & Flaming, 2009).

**Fitness Measures**

Other proxy measures of physical activity include measures of fitness. Blair, Melanson, and Freedson (1996) questioned the validity of fitness measure devices, as they found that there was a weak relationship between fitness and physical activity. In fact, several fitness measures must be highlighted when using proxy measures of physical activity, the most accurate measurement on aerobic fitness was maximal oxygen uptake ($VO_2max$).

Maximal oxygen uptake ($VO_2max$) test was about one's fitness in terms of the amount of oxygen that can be transported by the body to the muscles and muscle

efficiency in oxygen consumption. $VO_2max$ is measured when the subject is running on a treadmill through which an actual measure on body oxygen consumption can be done. However, the measurement can only accommodate one dimension on the treadmill, one participant at a time thus it is time-consuming and costly. Furthermore, the measurement is based on the assumption that if one is active, one will do better on it, which means it will be difficult to acquire best results because it disregards other dimensions of the activity (Brooks, Fahey, & White, 1996).

Another method is body composition. There are several ways to measure fatness, such as skin fold thickness measurement, electrical impedance and underwater weighing. Body composition is the ratio between muscle and fat distribution in the body. It assumes that body fat is directly related to fitness level, which means an individual with excess body fat is not active. However, this assumption cannot explain the issue of "fat but fit". The advantage of these measures is low cost, except underwater weighing, which is very expensive, difficult to be accessed by general population and there is no measure of the dimensions of physical activity (Brooks, Fahey, & White, 1996).

Body Mass Index (BMI) is another measuring method. BMI is the ratio between weight and height. It is cheap, easy to calculate, and can be used on large group at one time efficiently; while the disadvantage is that it may not be accurate.

Apart from the above fitness measures, self-report instrument is another method to measure physical activity, but self-report instruments may differ in terms of dimensions of physical activity, validity and reliability. Below is a brief review of self-report methods.

**Self-Report Instruments**

A self-report instrument is an instrument that requires a participant to recall the

amount of activity he/she have engaged in over a given period of time. Self-report can record both quantitative and qualitative information by the participant, which is low cost, quickly administered, can measure different dimensions of physical activity and had low expectations of the participant. However, there are various kinds of self-report, and many self-reports tend to be superficial measurement, lacking validity and reliability establishment (Brooks, Fahey, & White, 1996). Some self-reports have very detailed daily activity diaries/recalls which have the participant recording the activities he/she has engaged in over the course of that day such as the previous-day physical activity recall (PDPAR) (Weston, Petosa, & Pate, 1997). The advantage of this self-report is that the participant can recall activities within short sessions of time slots throughout the day based on habitual cues, which yields high reliability and provides assessment of all dimensions of the activity. For instance, researchers (Petosa, Hortz, Cardina, & Suminski, 2005; Weston, Petosa, & Pate, 1997) used the PDPAR by converting all types of activities, frequency, duration, and intensity of activity into estimates of energy expenditure. The duration of the activity is recorded in half-hour increments and also the recall of activity intensity, from light to hard, is used. A list of activities is provided for the participant to choose from and if the participant cannot find from the list the activity he/she has engaged in, it can still be recorded in other categories provided in the report.

PDPAR provided much information when compared to other self-report instruments (Petosa, Hortz, Cardina, & Suminski, 2005; Weston, Petosa, & Pate, 1997). For example, The Youth Risk Behavior Survey (YRBS) (Brener et al., 2002) and Stage of Change (SOC) (Marcus & Simkin, 1994; Reed, Velicer, Prochaska, Rossi, & Marcus, 1997) are good contrasts as these instruments do not measure all dimensions of activity. The YRBS measures intensity but not duration. It asks the participant to recall activities, which can be rated as moderate to vigorous, from the

previous seven days. Type of activity and energy expenditure cannot be calculated through this method because when frequency is measured in days, the investigator is not be able to know if the participant have engaged in a certain activity more than once in a day (Brener et al., 2002). Stage of change (SOC) (Marcus & Simkin, 1994; Reed et al., 1997) is an attempt to mix the cognitive processes and the behavior in one measure, which provides even less information. SOC consists of six stages: pre-contemplation, contemplation, preparation, action, maintenance, and termination. This measure disregards intensity, duration, specific type and energy expenditure of physical activity while frequency is recorded only up to three times a week (Marcus & Simkin, 1994; Reed et al., 1997).

**Summary**

To summarize, the above review of literature section identified the characteristics and strengths of various physical activity assessment measures. The present investigator weighed the pros and cons of the measurement methods. In this study, pedometer was used as process measure on physical activity and PDPAR-C (Weston, Petosa, & Pate, 1997) was used as outcome measure for physical activity.

**Psychosocial and Physical Activity Measures Used in the Current Study**

**Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ).** In the present study, psychosocial aspects of physical activity were assessed by the Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ), in which all items were based on selected items of the BIQ scale developed by Heller et al., (2006). BIQ was developed for adults with ID in community-based (Heller et al., 2006) with the sub-scales assessing: energy fatigue, pain, life satisfaction, health, work and retirement, living arrangement, social support, community

integration, choice-making, exercise knowledge, exercise and activity inventory, stage of change, exercise expectation, barrier to exercise, social/environmental support, and self-efficacy on behavioural changes in intervention programme. This assessment tool adopted for people with mild to moderate ID with 3-point Likert scale for ease of understanding (Heller et al., 2006). The tools may not be appropriate for people with more severe ID (Heller et al., 2006).

After a preliminary review on the items, three subscales of self-efficacy, outcome expectation, and barrier to exercise were used in this study because the rest of the categories were not relevant to this study. Chinese versions of psychosocial questionnaire instruments were not available; therefore a SOBQ was developed following a translation procedure.

SOBQ was valid and reliable as an outcome measure to be used for ID. The reliability and test-retest reliability of self-efficacy, outcome expectation and barrier to exercise reported by Heller et al. (2006) were .91, .79, .73; 0.52 ($p<0.01$), 0.72 ($p<0.01$), 0.55 ($p<0.01$); and test-retest from Pilot Study One conducted by the present investigator were .67, .78 and .71, respectively (See Chapter Three).

**Physical Activity Recall (PAR).** The present study adopted the face-to-face interview based on the Physical Activity Recall questionnaire (PAR) to indicate the physical activity level before and after work. In this study, the scoring system followed Hortz (2005) and Winters (2001) by converting physical activity to bouts of MPA per day with a bout defined as 30-minute time block. A score of 1 was recorded if the subject had at least one bout of MPA on a particular day. Therefore, the range of score from PAR was 0-5 signifying the number of days having MPA in five consecutive weekdays. The concurrent validity of PAR was established (Hortz, 2005) (See Chapter Three) and the Chinese version of PAR has been back-translated by

Cheung (2006), and was used in a pilot study conducted by the present investigator (Chan, 2010b) for ID to measure physical activity level in Hong Kong (See Chapter Three).

**Pedometer.** Walking appears to be the most common form of physical activity for individuals with ID (Bassett, et al., 2008; Tudor-Locke & Bassett, 2004). Pedometer was regarded as the most appropriate indicator of assessing walking activity of adults with ID (Pitchford, 2010). Many studies had indicated that pedometer was user-friendly, unobtrusive and relatively inexpensive device and was particularly practical for use among populations with ID (Beets & Pitetti, 2011; Hilgenkamp, Wijck, & Evenhuis, 2012; Pitchford & Yun, 2010; Pitetti et al., 2009; Temple & Stanish, 2009). Stanish (2004) examined the accuracy and feasibility of pedometers for monitoring walking in 20 adults with ID and recorded the step counts and distance walked for one week. Intra-class correlation coefficients were above .95. A t-test revealed no gender differences in walking activity. Pitetti (2009) demonstrated pedometers had accuracy during walking among youth with ID by eighteen youths (11 girls, 7 boys) of 4-14 years completed six 80-meter self-paced walking trials while wearing a pedometer at five waist locations (Pitetti et al., 2009). Whereas, in the more recent study, Pitchford and Yun (2010) found that pedometer was highly consistent and reliable with intraclass correlation coefficients ranged from 0.89 to 0.97 for participants in adults with Down syndrome. Pitchford and Yun study showed that pedometer was not only suitable for youth, but it was also suitable for adults with ID.

Furthermore, Hilgenkamp (2012) found that any 4 days of wearing a pedometer was sufficient to validly measure physical activity in older adults with ID while Temple and Stanish (2009) suggested that 3 days of pedometer wear was sufficient to predict average weekly steps among adults with ID. In the present study, pedometer

step counts were recorded for five consecutive days (Monday to Friday) as a process measure in the twelve weeks of intervention programme and a step goal of 10,000 step/day was targeted throughout the intervention programme (Tudor-Locke & Bassett, 2004).

# CHAPTER 3

# METHODOLOGY

The present study was a Social Cognitive Theory (SCT) based physical activity intervention targeting non-working time physical activity of workers with ID, which was a randomized pre- and post-test trials design. The main purposes were to evaluate the effectiveness of the twelve-week intervention with regard to psychosocial behaviour (Self-efficacy, Outcome Expectation, Barrier to Exercise) using SCT and physical activity behaviour (Moderate Physical Activity) among adults with intellectual disabilities working in sheltered workshop.

A SCT-based Physical Activity Intervention Programme was delivered. Evaluation of the effects of the programme consisted of several levels. Behavioral assessments, implementation evaluation, and construct validation were conducted. The sections of this chapter include: 1) Pilot Study One, Two, and main study, 2) measurement tools and variables, 3) data collection, 4) data management, and 5) data analysis. The main purposes of the Pilot Study One and Pilot Study Two were to determine the validity and reliability of each questionnaire, SOBQ and PAR, respectively.

## Pilot Study 1: Walking Activity and Psychosocial Variables of Physical Activity among Adults with Intellectual Disabilities

### Introduction

In Hong Kong there is relatively little information on the physical activity patterns of workers with ID. When compared with the general population, research showed that persons with ID generally die at an earlier age than adults in the general population (average age at death: 66.1 years) and the longevity for adults with Down's syndrome is 55.8 years in average (Day, Strauss, Shavelle, & Reynolds, 2005).

Besides, obesity is more prevalent in adults with ID than in the general population (Draheim, Williams, & McCubbin, 2002; Martin and Sinden, 2001; U.S. Department of Health and Human Services, 2000), with high risk of chronic diseases associated with obesity (Beange, Lennox, & Parmenter, 1999; Fernhall, 1993; Fernhall et al., 1998; Fernall 1998; Lancioni & O'Reilly, 1998; Rimmer et al., 2010). Research showed that regular PA benefits health (CDC, 2008), and walking as a type of PA has been shown to be a moderate intensity PA (Bassett, Mahar, Rowe, & Morrow, 2008) that is suitable to people with ID (Tudor-Locke & Bassett, 2004). For healthy adults, 10,000 steps per day is a reasonable goal. Individuals who use pedometer can check if the steps fall short of this value, and try to increase the activity level by 1,000 steps per day every two weeks until he/she reaches the goal (Tudor-Locke & Bassett, 2004). Since walking appears to be a primary activity of people with ID, walking behavior was assessed by pedometer in terms of walking steps taken among adults with ID in this pilot study.

**Hong Kong Sheltered Workshop**

In Hong Kong, there are 34 sheltered workshops with 5,047 quotas for people with ID over 15. Sheltered workshop provides occupation rehabilitation for people with ID; participants have an income-generating production work in an adapted working and training environment. The aim of the service is to elicit trainees' potential and to enhance their holistic growth and integration into the community. There are different types of work for trainees, such as: packaging, mailing process, production and design of name card and banner, book publishing and binding, typesetting, laundry service, sewing, and production of ceramic, handicraft and embroidery. The job nature for most of the trainees are sitting job, which is usually simple and repetitive, only few potential trainees have training on tasks such as:

cleaning, computer applications, office works, social and personal relationships, job seeking and interview techniques etc. After placement, support and training services are provided to facilitate trainees' integration into the working environment (Social Welfare Department, 2008).

**Body Mass Index Measurement**

According to World Health Organization in 2000 (Inoue et al, 2000), data showed that there was an increase of obesity rate in both developed and developing countries which associated with an increase of obesity-related morbidity and chronic disease. The criteria to define overweight and obesity using BMI; however, is not appropriate to measure Asian population, especially Chinese. Although the prevalence of obesity rate in Asia is lower than that in Europe, Asian population was at risk of type 2 diabetes and cardiovascular disease with the lower body mass index (BMI) (Inoue et al, 2000). A new criterion to define overweight (≧23) and obesity (≧25) in the Asia-Pacific Region has been suggested. WHO in 2000 (Inoue et al, 2000) recommended Asia-Pacific region to have lower cut-off point than the existing WHO cut-off point for overweight (25 $kg/m^2$). However, it was not necessary to have one clear BMI cut-off point for all Asians for overweight or obesity. The BMI cut-off point for observed risk in different Asian populations varies from 22 $kg/m^2$ to 25 $kg/m^2$; whereas for high risk, it varies from 26 $kg/m^2$ to 31 $kg/m^2$. Lowering cutoff values by three units (as seems appropriate for Hong Kong Chinese, Indonesians, and Singaporeans) would have been too much for other populations (eg, northern Chinese and Japanese) (WHO, 2004). Since the purpose of a BMI cut-off point is to identify, within each population, the proportion of people with a high risk of an undesirable health state that warrants a public health or clinical intervention (WHO, 2004), the present study applied the new criterion to define overweight (≧23) and obesity (≧25)

(See Table Two) for adults with ID in Hong Kong as people with ID are in increased risk of obesity related disease. On the other hand, WHO (2004) suggested that, in populations with a predisposition to central obesity and related increased risk of developing the metabolic syndrome, waist circumference should also be used to refine action levels on the basis of BMI (WHO, 2004). The present study measured waist circumference together with BMI to indicate the risk of co-morbidities (Inoue et al, 2000) (See Table Two).

Table 2.

**Co-morbidities risk associated with different levels of BMI and waist circumference in adult Asians**

| Classification | BMI ($kg/m^2$) | Risk of co-morbidities | |
|---|---|---|---|
| | | Waist Circumference | |
| | | ＜90 cm (men)<br>＜80 cm (women) | ≧90 cm (men)<br>≧80 cm (women) |
| Underweight | ＜18.5 | Low (but increased risk of other clinical problems) | Average |
| Normal range | 18.5-22.9 | Average | Increased |
| Overweight: | ≧23 | | |
| At risk | 23-24.9 | Increased | Moderate |
| Obese I | 25-29.9 | Moderate | Severe |
| Obese II | ≧30 | Severe | Very severe |

**Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ)**

Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ) contains selected items from Baseline Interview Questionnaire (BIQ), which was used as an instrument to measure psychosocial variables in the present study.

According to Hutzler and Korsensky (2010), BIQ was a comprehensive instrument for measuring motivational correlates of PA, including: barriers to exercise, attitude towards exercise, exercise knowledge, confidence to perform exercise social environmental support, depression, and life satisfaction that is suitable for adults with ID. The review from Chapter Two also showed that two out of five interventions applied baseline interview questionnaire (BIQ) as the instrument to assess social-cognitive aspects of exercise adherence for adults with mild to moderate grade ID and was considered to be reliable and useful to exercise adherence.

**Self-Efficacy.** Self-efficacy for physical activity was measured using a 5-item, 3-point Likert-type instrument (1=not at all sure, 3=totally sure). The purpose of this instrument was to assess the degree of self-efficacy to perform PA. The Cronbach's alpha coefficients reported to be .91. and test-retest correlation for the instrument was =0.52 (Heller et al., 2001). The possible range of scores for self-efficacy was 1-15. A high score indicates a high level of confidence to overcome physical activity barriers (Heller et al., 2001).

**Outcome Expectation.** Outcome expectation for physical activity was measured using a 9-item, 3-point Likert-type instrument (1=not help/not feel happier, 3=help/feel happier). The purpose of this instrument was to assess the physical activity perception. The Cronbach's alpha coefficients reported to be .79. and test-retest correlation for the instrument was=0.72 (Heller et al., 2001). The possible range of the scores for outcome expectation was 1-27. A high score indicates higher expectation on physical activity (Heller et al., 2001).

**Barrier to Exercise.** Barrier to Exercise was measured using a 9-item, 3-point Likert-type instrument (1=not a barrier, 3=yes, a barrier). The purpose of this instrument was to assess the degree of barriers towards physical activity. The Cronbach's alpha coefficients reported to be .73. and test-retest correlation for the

instrument was=0.55 (Heller et al., 2001). The possible range of the scores for outcome expectation was 1-27. A high score indicates higher barrier on physical activity (Heller et al., 2001).

**Pedometer**

To improve physical fitness, Casperson (2008) suggested walking as physical activity to improve health (Caspersen & Fulton, 2008) which was in line with the American College of Sports Medicine (ACSM) guidelines in 2004 for health-promoting physical activity for people that healthy adults should have 10,000 steps per day (Haskell, 2007). However, walking activity among adults with ID was low. Stanish (2005) measured walking activity in 103 adults (65 males, 38 females) with mental retardation (MR). Participants wore a pedometer for seven consecutive days and results showed that the mean weekly step counts was 58,321 ± 26,896 and only 21.4% of the participants recorded 10,000 steps/day (Stanish, 2005). Findings demonstrated that people with intellectual disabilities were not reaching the health guidelines on participating physical activity. Bassett, Mahar, Rowe, and Morrow (2008) stated that walking is an important form of physical activity and that can be practiced by people of nearly all ages and walking is a common physical activity reported by individuals with ID.

Given the benefits of walking, evidence suggested that using pedometer, which can be associated with increased physical activity, can improve health. Bravata (2007) stated that the use of a pedometer was associated with a significant increase in physical activity by 26.9% over baseline, a decrease in body mass index by 0.38 (Bravata et al., 2007). Report showed that the use of pedometer was contributive to increasing physical activity significantly and decreasing body mass index significantly, but durability over an extended period of time could not be ascertained.

Stanish (2004) examined the accuracy and feasibility of pedometers for monitoring walking in twenty adults with ID and recorded the step counts and distance walked for one week. Pedometer counts were highly consistent with actual step counts during normal and fast paced walking on two ground surfaces (Stanish, 2004). Besides, pedometer was highly consistent and reliable for adults with ID with interclass correlation coefficients ranged from 0.89 to 0.97 (Pitchford & Yun, 2010) and .95. (Stanish, 2004). A t-test revealed no gender differences in walking activity (Stanish, 2004).The results not only indicated that pedometers are accurate in recording step counts in adults with ID, but also showed that pedometers are suitable for the walking activity of adults with ID. Furthermore, pedometer is a good instrument not only for counting the steps but also is a motivator for individuals to be physically active. According to Locke's study (2004), there are indices to be used to classify pedometer-determined physical activity in healthy adults: Sedentary (Steps per day <5,000), Low active (Step per day 5,000 – 7,499), Somewhat Active (Step per day 7,500 – 9,999), Active (Step per day 1,0000 – 12,500) and Highly Active (Step per day >12,5000). For healthy adults, 10,000 steps per day is a reasonable goal. Individuals who use pedometer can check if the steps fall short of this value, and try to increase the activity level by 1,000 steps per day every two weeks until he/she reaches the goal (Tudor-Locke & Bassett, 2004). Since walking appears to be a primary activity of people with ID, this current pilot study investigated the walking behavior of adults with ID by pedometer (See Table Three).

Table 3.

**Classification on activity level based on steps per day**

| Steps per day | Activity Level |
|---|---|
| **<** 5,000 | Sedentary |
| 5,000 – 7,499 | Low Active |
| 7,500 – 9,999 | Somewhat Active |
| 10,000 – 12,500 | Active |
| **>** 12,500 | Highly Active |

**Purpose**

Prior to the main study, a pilot study was conducted with the following purposes: 1) to get information on the background, demographic data and the lifestyle of adults with ID working in the Hong Kong sheltered workshop, and 2) to get information on physical activity behaviour in terms of walking steps taken among adults with ID and psychosocial behaviour of adults with ID working in the Hong Kong sheltered workshop, 3) to assess the validity and reliability of the SOBQ, and 4) to conduct a trial run to test the feasibility on running a larger scale in future main study in sheltered workshop. The findings of this Pilot Study One served to consolidate the foundation for the main study.

**Methods**

**Design.** A descriptive Pilot Study One was conducted in May 2009 aiming to collect information on the background, demographic data and the lifestyle of adults with ID working in the Hong Kong sheltered workshop.

**Setting.** The Pilot Study One was administrated at three agencies that served adults with ID. They were St. James Settlements located in Hong Kong Island, the

Spastics Association of Hong Kong and the Mental Health Association of Hong Kong located in Kowloon.

**Sample.** This Pilot Study One involved 40 volunteers with 2 dropped out due to sickness during the field testing period. A total of 38 adults over the age of 18 years old with mild to moderate ID (20 males, 18 females), (Mean age=37.6, SD=10.1) were recruited from three sheltered workshops. Only those adults with ID who returned the signed parental consent form were recruited as participants.

**Measures.** Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ) (Heller et al., 2006) regarding adult's self-efficacy, outcome expectation, barriers to exercise were examined. SOBQ was administered face-to-face by an interviewer on its subscales of self-efficacy, outcome expectation and barrier to exercise on physical activity. Walking activity was recorded by pedometer (SW-700, Yamax, Japan).

***SOBQ.*** The self-efficacy scale contains 5 items pertaining to the confidence that one has in performing exercise, including being able to use various kinds of exercise equipment and feeling comfortable performing strength and cardiovascular exercises. Outcome expectations scale includes 9 items on a 3-point Likert scale: looking better, hurting less, controlling weight, making body feel good, feeling happier, feeling less tired, meeting new people, getting in shape, and improving health. Perceived barriers scale includes 9 items about barriers towards exercise participation. The barriers include lack of energy, lack of interest, lack of time, perception that exercise is boring, will make condition worse, will not improve condition, is too difficult, the subject being too lazy, and the subject having health concerns. It is rated on a 3-point Likert scale from 1 (not a barrier) to 3 (yes, a barrier) for the person with ID. For items on self-efficacy and outcome expectation, they were rated on a continuum from 1 (not at all sure) to 3 (totally sure). Each subscale total score was calculated by adding scores

of items categorized by the subscale.

Chinese version of SOBQ instrument was not available. A translation procedure (translated and back-translated) was undertaken based on Hambleton and Kanjee's description (Hambleton & Kanjee, 1995). The translation work was conducted by a degree holder major in translation. The back-translated Chinese version was conducted by a degree holder major in English and was evaluated by two panels of special school teachers who had major in language and were familiar with the language ability of people with ID. After the translation and back-translate process, content validity of the SOBQ was evaluated by two language teachers, who had an average of 10 years working experience in special school and major in Chinese. They checked and amended the wordings of the SOBQ and the verbal rendering of the items in SOBQ for the face-to-face interviews with the participants. The SOBQ was pilot tested by the present investigator with 20 participants and they were retested after one month's time. The test-retest by intra-class correlation reliability of SOBQ were .67, .78 and .71, respectively. The reliability and test-retest relibaility of self-efficacy, outcome expectation and barrier to exercise reported by Heller et al. (2006) were .91, .79, .73; 0.52, 0.72, 0.55 respectively (See Chapter Two).

***Pedometer.*** In order to avoid participants' reactivity, physical activity behaviour in terms of walking steps taken among adults with ID was collected by a sealed pedometer (SW-700, Yamax). Pedometer is a valid and reliable tool in assessing step counts for adults with ID (Pitchford & Yun, 2010 and Stanish, 2004) Pedometer step counts were recorded on four consecutive week days with participants wearing the sealed pedometer on their right waist during waking hours except shower or swimming. Before data collection, a 30-step test and 30-shake test (Vincent & Sidman, 2003) were performed to assess the pedometer's accuracy and all the pedometers had batteries replaced.

***Demographic***. Demographic information was collected using a simple, verbally administered questionnaire. Height, weight and waist circumference were measured by the test administrator with a standard tape measure and Physician scale for the calculation of BMI (Inoue et al., 2000).

**Procedures.** The measuring package for the present study contained the Chinese version of SOBQ (see Appendix E). The participants completed the SOBQ with an interviewer face-to-face conducting interview in the morning on the fifth day before participants started work.

Test administrators collected the pedometer with step counts being recorded in a log book separately during working hours and non-working hours on each four consecutive week days; and another pedometer was given to each participant a) every morning before participants started work and b) at the end of the work day. Administrators also had to record the participant's wake-up time, bedtime, time they go to work, time they get off work, type of transportation, commuting time, types of activity and duration of time after work before sleep.

## Result

**Demographics.** Thirty-eight participants completed the Pilot Study One (20 males, 18 females), (mean age=37.68, SD=10.12) (See Table Four). They lived in Wan Chai (N=21) and Kwun Tong (N=17) and they usually took school bus (29%) to work. The mean wake-up time was 7 am and bedtime was 10 pm, the mean start-work time was 8:10 am and end-work time was 4:00 pm (See Table Five). The mean step counts during office hours was 3685 steps, SD=2192 and the mean step counts during non-working hour was 4212 steps, SD=3129. 51% of the participants had activities after work; which were usually of light housework with less than 15 minutes (37%) of their non-working time. The mean total daily step counts was 7432 (SD=4073) (See

Table Six).

Table 4.

Anthropometric data among Participants (Mean, SD)

| Variable | Male (n=20) | | Females (n=18) | | Total (N=38) | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| Age | 35.90 | 11.70 | 39.67 | 7.90 | 37.68 | 10.13 |
| Height (m) | 1.61 | 0.07 | 1.52 | 0.09 | 1.57 | 0.09 |
| Weight (kg) | 64.10 | 15.86 | 68.82 | 20.08 | 66.34 | 17.89 |
| BMI ($kg/m^2$) | 24.76 | 5.56 | 29.84 | 9.61 | 27.17 | 8.06 |
| Waist Circumference (inches) | 34.33 | 5.09 | 36.14 | 4.50 | 35.18 | 4.84 |

**Physical Activity Measure.** Physical activity data of pedometer on step counts appear to be sufficiently normally distributed on mean step at work (skewness = 0.5, kurtosis = 0.5), mean step after work (skewness = 1.6, kurtosis = 3.9), and mean step per day (skewness = 1.1, kurtosis = 2.4) (Kline, 2005); therefore, parametric statistical tests were used in this pilot study. According to the findings, adults with ID had more step counts in non-working time compared with that at working time, which was considered on the low side in physical activity level (Steps per day=5,000-7,499) (Tudor-Locke & Bassett, 2004). The result from BMI showed that most of the participants were obese (BMI >25) (Inoue et al., 2000). The mean BMI was 27.17 (SD=8.05) and the mean waist circumference for male was 34.33 inches (SD=5.09)

and for female was 36.14 inches, (SD=4.49) (See Table Four). These indicated that abdominal fat was high in both men and women with ID, which increased health risk. Combining both BMI and waist circumference, findings also showed that both male and female were classified as obese (BMI 25 or above, waist circumference >90 cm in men or >80 cm in women) (Inoue et al., 2000), meaning that males had moderate risk of diseases and females had severe risk of diseases (Inoue et al., 2000). Findings also showed that both male and female participants had more step counts after work (male: 4024.89, SD=2822.90; female: 4421.39 SD=3509.97) compared with the steps at work (See Table Six).

Besides, the pedometer-recorded step counts showed a significant positive relationship between the mean step counts after work and mean step counts per day ($r=0.89$, $p<0.01$), and the duration of working hours correlated to the self-efficacy to exercise ($r=0.44$, $p<0.01$).

Table 5.

Working Hour among Participants (Mean, SD)

| Variable | Mean Hours of Working | | Mean Hour of Non-working | |
|---|---|---|---|---|
| Working Hour (Daily): | Mean | SD | Mean | SD |
| Male (n=20) | 7.02 | 1.60 | 14.82 | 1.27 |
| Female (n=18) | 7.12 | 1.30 | 14.83 | 0.87 |
| Total (N=38) | 7.06 | 1.44 | 14.82 | 1.09 |

Table 6.

Walk Step among Participants (Mean, SD)

| Variable | Step at Work | | Step after Work | | Step per Day | |
|---|---|---|---|---|---|---|
| Step Counts (Daily): | Mean | SD | Mean | SD | Mean | SD |
| Male (n=20) | 3520.87 | 2419.56 | 4024.89 | 2822.90 | 7140.60 | 3870.90 |
| Female (n=18) | 3869.25 | 1962.17 | 4421.39 | 3509.97 | 7756.08 | 4377.82 |
| Total (N=38) | 3685.89 | 2192.33 | 4212.70 | 3129.35 | 7432.14 | 4073.95 |

**Psychosocial Measures.** Psychosocial data of SOBQ appear to be sufficiently normally distributed on self-efficacy (skewness = 0.2, kurtosis = 0.6), outcome expectation (skewness = 1.1, kurtosis = 0.5), and barrier to exercise (skewness = 0.3, kurtosis = 1.1) (Kline, 2005); therefore, parametric statistical tests were used in this pilot study. Scores of each item of the SOBQ ranged from 1-3 with values close to 1 indicating low score in psychosocial self-efficacy, low outcome expectation and low barrier to exercise. Questions on psychosocial aspect towards PA included self-efficacy (Mean=4.37, SD=3.05), outcome expectation on physical activity (Mean=12.44, SD=3.92), and barrier to exercise (Mean=15.11, SD=3.40) (See Table Seven).

Table 7.

Psychosocial Aspect towards Physical Activity among Participants (Mean, SD)

| Variable | Male (n=20) | | Females (n=18) | | Total (N=38) | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| Self-efficacy | 4.50 | 2.69 | 4.22 | 3.49 | 4.37 | 3.05 |
| Outcome expectation | 11.80 | 3.62 | 13.17 | 4.20 | 12.44 | 3.92 |
| Barrier to exercise | 14.15 | 2.60 | 16.17 | 3.91 | 15.11 | 3.40 |

**Correlation between SOBQ Variables and Physical Activity.** The convergent validity was assessed by correlating SOBQ subscale score and pedometer step counts. There was a statistically significant positive relationship on self-efficacy with correlation coefficient r=.44 and a small relationship on outcome expectation and barrier to exercise with r=.08 and r=.07, respectively. Reliability was tested by Cronbach's alpha with good internal consistency of .81, .72, .70 on self-efficacy, outcome expectation and barrier to exercise respectively.

## Discussion

Contrasted with the general population, adults with ID had a high risk in obesity, which had been demonstrated to be a risk factor affecting health and longevity (Bartlo & Klein, 2011; Crouter, Schneider, Karabulut, & Bassett, 2003; Draheim, Williams, & McCubbin, 2002; Faulkner, 2005). Given the paucity of studies on the effectiveness of weight loss intervention among adults with ID, there was an urgent need to develop an effective and applicable exercise intervention for them.

Frey's (2004) study showed that adults with ID were significantly less active and data also revealed that the average duration of moderate-to-hard physical activity accrued per day was 10 minutes less than the level recommended for health. Findings from Temple et al. (2006) on physical activity of adults with ID showed that only one third or fewer were sufficiently active to meet the various health promotion guidelines for physical activity and to achieve health benefits. They suggested that it was necessary to find ways to get people with disabilities more involved in physical activity, particularly the intellectually disabled (Temple et al., 2006).

In this study, the investigator found that among this small sample of Hong Kong Chinese ID workers, about 45% of men and 83% of women were considered as obese, while 15% of men and 72% of women exceeded the healthy standard of waist circumference (men over 40 inches; women over 35 inches) (Hong Kong: Department of Health, 2008). Compared to the general working population, the obesity rate of ID workers was worrisome, especially in females. The percentage of female obesity (83%) in this study was almost six times above female without ID (13.6%), which was 69.4% higher than the female workers without ID (Hong Kong: Department of Health, 2008). However, the percentage of ID male workers' obesity (20%) was lower than that of the male population without ID (32.2%) (Hong Kong: Department of Health, 2008).

In the present result, compared to general population in Hong Kong, higher obesity rate in females with ID could be explained by the societal standard of beauty among females in the general population in Hong Kong that females tend to keep a slim body shape which is often tied with beauty. Therefore females in the general population would be more conscious on their body fat than males. Thus, when comparing the rate of obesity with the same gender, the females with ID could have much higher rate of obesity. On the other hand, when comparing with males with ID,

the obesity rate was higher in females with ID. This could be explained by the different job nature at work between males and females in different Hong Kong sheltered workshops, as some women with ID cannot take outside duties which require greater physical strength, instead they can only take sitting job in sheltered workshop; while some of the men with ID can take outside duties such as car washing. Besides, it has been speculated that heritability, motherhood might be another reasons on higher percentage of obesity among female participants. Female participants are often not being socialized to be physically active; they are usually assigned to have some sedentary job but not outdoor mobile job for safety reason. According to Robertson et al. (2000), obesity in women and physical inactivity was high, the result in this pilot study was in line with Stancliffe (2011) that the obesity rate for males with ID was lower than for the general population, and women with ID had higher prevalence of obesity (Stancliffe, 2011). Hamilton's study (2007) reported that the obesity among women with ID was higher than that in men and also in the general population (Hamilton, 2007). Stancliffe (2011) explained that obesity prevalence differed by living arrangement that people living in their own home had the highest prevalence of obesity (Stancliffe, 2011).

When contrasting the waist circumference with the general population in 2007 (Ko et al., 2007), severe central obesity (waist circumference >39" in men or >34" in women) in Hong Kong Chinese working population were 26.7% in both men and women; while in this pilot study, severe central obesity rates among the ID subjects were 15% in men and 75% in women. Again, a great gender difference was found in female obesity rate. Female participants (72%) were 45.3% higher than the general female working population (26.7%). In conclusion, the percentage of obesity was serious among women with ID while the percentage of obesity among men with ID was not.

In walking activity, relatively large standard deviation (SD) on total mean steps per day (Mean=7,432, SD=4,073.95) can be explained by the locale of the centers and the transportation between workplace and home. Some participants took shuttle bus to work and return home, while some traveled between workplace and home on foot (29%) or by public transport (51%). The slight difference between male and female on steps taken can be explained by different job nature at work between male (Mean=3,520.87, SD=2,419.56) and female (Mean=3,869.25, SD=1,962.17) with ID, since most of the female participants had a sitting job, while only some male participants might have occasional outside duties such as car washing (information were not allowed to be disclosed). Data showed that mean step counts at work between male (Mean=3,520.87, SD=2,419.56) and female (Mean=3,869.25, SD=1,962.17) were slightly different, yet both of their step counts at work did not reach the recommended guideline of 10,000 steps per day (Croteau, 2004), which might imply that both male and female ID participants usually engage in a sitting job at work that reinforces sedentary lifestyle and thus they have a higher risk of becoming obese. In fact, result from present study supported that the nature of job related to the low step counts. Although participant engaged more time at work, the step courts at work were lower than that after work. Both male and female participants had more step counts after work in 6 hours from 4pm to 10pm (male:4024.89, SD=2822.90; female:4421.39, SD=3509.97) compared with the steps at work in 8 hours from 8am to 4pm (male:3,520.87, SD=2,419.56; female=3,869.25, SD=1,962.17) (See Table Five and Six).

Furthermore, the pedometer-recorded step counts was used to show the relationship between the mean step counts after work that had a significant positive correlation with mean step counts per day ($r=0.89$, $p<0.01$), which suggested that non-working hour was crucial in affecting the total step counts per day. Besides,

working hours correlated with the self-efficacy to exercise ($r=0.44$, $p<0.01$), the results not only reflected the job nature in worksite that office hour affected much on the step counts per day, but also self-efficacy, this suggested that sedentary job nature with long working hours enhanced the sedentary lifestyle and might affect self-efficacy to exercise among adults with ID in worksite. This is exactly Bandura's (1986) triadic and reciprocality relationship between personal, environmental and behaviour.

In psychosocial outcomes, comparative data for the general population using equivalent measures for the psychosocial factor was not available; however, the results suggested that both male (Mean=11.80, SD=3.62) and female (Mean=13.17, SD=4.20) participants had relatively high outcome expectation, but female (Mean=16.17, SD=3.91) perceived higher barrier towards exercise than male (Mean=14.15, SD=2.60) participants. Both male (Mean=4.50, SD=2.69) and female (Mean=4.22, SD=3.50) participants had low self-efficacy, but female participants had the lowest score in self-efficacy compared to male participants. In Cardinal' study (2004), there were similar outcomes from the special population on barrier to exercise, and self-efficacy score.

Relationship between SOBQ variables and PA by Pearson correlation coefficient showed a positive correlation of self-efficacy ($r=.44$, $p<0.01$) that participants have high self-efficacy towards PA correlated with high PA participation. SOBQ with self-efficacy, outcome expectation and barrier to exercise had good internal consistency, with a Cronbach alpha coefficient reported of .81, .72, .70 respectively. SOBQ is valid and reliable as an outcome measure to be used for ID. SOBQ scale consisting items taken out from BIQ has been well established for measuring self-efficacy (Heller, 2001), outcome expectation (Heller & Prohaska, 2001) and barrier (Heller, Rimmer, & Rubin, 2001). BIQ has been used in the large scale of

health education programme for adults with ID (Heller, Marks, & Sisirak, 2006).

**Limitation.** This study had a few limitations. The present investigator could not verify the disability grade among the participants as the data on the disability grade were confidential in most of the centers. Some of the data such as type of participants' work or health status were not allowed to be disclosed, and the sample represented adults with mild to moderate ID which were based on a centre supervisor's confirmation. The results were based on mild to moderate grade participants wearing pedometer for four consecutive days, and the data reflected that adults with ID were obese. However, for those who were unable to wear the pedometer by themselves were excluded from this study (severe grade). If they were included, results would differ. Moreover, the results only reflected the number of steps during weekdays. There was no data on weekends.

**Significance.** Useful descriptive information of background, demographic data and the physical activity behaviour in terms of walking steps on adults with ID in Hong Kong sheltered workshop were successfully obtained in Pilot Study One. This study revealed the lifestyle of adults with ID, and revealed the low step counts (Mean=3685.89, SD=2192.33) on participants in sheltered workshop during working hour, especially on female participants. Result showed that both male and female participants had low self-efficacy and high barrier to exercise, further exploration of walking activity and psychosocial behaviour in this population was needed.

SOBQ is a valid and reliable questionnaire for adults with ID and participants seem to be able to understand the contents of SOBQ. Although the SOBQ scale has been well established (Heller, Marks, & Sisirak, 2006), data should be interpreted with caution as only self-efficacy is valid in this pilot study. Pilot study two was

needed to further assess the validity of SOBQ.

The trial run on Pilot Study One identified the feasibility on running a larger scale programme in Hong Kong's sheltered workshop in future main study. Further work on identifying activity level and the physical activity pattern on non-working days (weekend) was needed in order to help planning intervention strategies towards reducing weight problem and risk of health in the lives of adults with ID. Besides, with the high obesity rate found in female ID, Pilot Study Two was conducted to collect physical activity on both weekdays and weekends with a focus on female ID participants in Hong Kong sheltered workshop.

## Pilot Study 2: Walking and Daily Physical Activity Intensity among Adults with Intellectual Disabilities

### Introduction

Based on the information from Pilot Study One, result showed that workers with ID usually have sedentary jobs, which may have affected the amount of PA accrued daily. Although, both male and female had low daily walking steps counts, result showed that female workers with ID in sheltered workshop had higher BMI compared with male workers with ID. To acquire a better understanding of female workers in sheltered workshop, Pilot Study Two focused on female participants' PA pattern during weekday and weekend.

### PAR

Physical Activity Recall (PAR) was used to evaluate physical activity behaviour from Previous Day Physical Activity Recall (PDPAR). Weston et al. (1997) reported a high test-retest reliability score ($r=.98$, $p<0.01$) and validity estimated against pedometer step counts, accelerometer counts and heart rate monitoring, ranging from

r=.77 to r= .88. The instrument was adopted by Cheung (2006) for use in Chinese population in Hong Kong and validity correlation with pedometer was r=.56. (Cheung, 2006). Health benefits have prompted several organizations to recommend that adults 18-65 should engage in moderate-intensity physical activity for at least 30 minutes or more on 5 or more days of the week (CDC, 2008); in order to record bouts of MPA per day (Hortz, 2005; Winters, 2001). The instrument was modified by Lum and Petosa in 2003 with concurrent validity established with 7-day diaries of PA (r=0.72) and correlated with actigraph accelerometers (r=0.83) for moderate activity (Hortz, 2005). The instrument was divided into light, moderate and vigorous activity, and participants have to report days, minutes of activity and type of activity for the past day for both, light, moderate and vigorous physical activity. For moderate activity, 30 minutes or more of single bout of activity has to be met in order for the activity to be counted as a 'day' of moderate activity (Hortz, 2005; Petosa, 2009; Winters, 2001).

In the current study, further evaluation on concurrent validity of the modified PAR would be validated by pedometer (Yamax SW700, Japan) and actical (Respironics, USA) among adults with ID in Hong Kong. Both devices have been shown to be valid and reliable for people with ID (Belza et al., 2004; Esliger, 2007; Michael, Green, & Farquhar, 2006; Pitchford & Yun, 2010; Pitetti et al., 2009; Stanish, 2004).

**Scale of Measurement**

There were a number of statistical techniques available and they were classified into two main groups, parametric and non-parametric. Parametric statistics, such as t-tests, ANOVA, Pearson correlation, were more powerful than non-parametric statistic, such as Kruskal-Wallis, Mann-Whitney U, Chi-square; but required some assumptions according to different parametric techniques being used. According to

Pallant (2007), there was a common situation in social science research that assumptions were not meet for the statistical technique that researchers want to use, such as the skewed distributed attributes. Pallant (2007) suggested three choices to those assumptions were not meet for the statistic being used. First, keep using parametric technique anyway, especially if there was a good sample size that would tolerate minor violations of assumptions. Second, transform variables, so that the assumption of the statistical test was met. This involved mathematically modifying the scores using various formulas until the distribution looks more normal, but this option was considerable controversy. Third, use non-parametric techniques, but these techniques were tend to be less powerful as they were less sensitive in detecting a relationship or a difference among groups (Pallant, 2007). Following Kline's (2005) recommendations, the skewness and kurtosis indices should not exceed an absolute value of 3 and 10 respectively (Kline, 2005). None of the data in this study had problematic levels of skewness or kurtosisis; therefore, data appear to be sufficiently normally distributed, parametric statistical tests were used in the present study.

**Actical**

Actical (Respironics, USA) was used to validate pedometer and PAR in the Pilot Study Two. The criterion-related validity correlations (r) for the actical were 0.73 at the slow walk condition and 0.99 at the normal walk and run conditions for normal population aged from 9 to 59 years old (Esliger, 2007). Actical was applicable and suitable for people with ID as the walking pace for them were usually slow (Belza et al., 2004; Michael, Green, & Farquhar, 2006).

Actical has been designed for recording physical activity. The actical activity monitor is lightweight, and can be worn on the hip (waist), wrist or ankle. The optimal placement of the actical device is the iliac crest of the hip, secondly on the wrist and

thirdly on ankle for accurate and consistent measurement (Respironics, 2008). Although actical devices are waterproof and it can tolerate normal daily experiences, participants were asked to take off the device during shower and swimming to ensure the integrity during the study. Actical can record physical activity in different forms: step, energy expenditure, and activity counts. The number of steps taken was recorded in terms of 5.5 days with 15-second; 11 days with 30-second or 44 days with 1-minutes of memory. For energy expenditure, actical can convert movement (activity counts) into energy units (calories), and the energy expenditure is expressed in kilocalories. Actical also has two energy units available; that are Activity Energy Expenditure (AEE) and Metabolic Equivalent (METs). AEE is the number of kilocalories expended per minute per kilogram of subject weight, while METs is the total amount of energy the body used to sustain itself, including basal metabolic rate. For activity counts, physical activity intensity is shown in minute within each category: sedentary (sleep or rest), light (sorting cards, writing letter), moderate (sweeping floors, vacuuming, dusting), and vigorous (treadmill walking 2.5 to 3.0 mph, treadmill jogging 4.5 mph) (Respironics, Inc., 2008). To ensure all the data can be recorded by the actical, 1-minute of memory was chosen to record the steps taken throughout the Pilot Study Two. To test the correlation between actical, PAR and pedometer, score on step counts and physical activity intensity from actical were collected.

**Purpose**

Another small scale descriptive pilot study (Pilot Study Two) was conducted with the following purposes: 1) to determine the physical activity among the working women with ID using PAR; 2) to examine the steps taken on working days and non-working days as measured by pedometer. 3) to examine the physical activity intensity during weekdays and weekends as measured by actical; 4) to examine the

psychosocial behaviour among female adults with ID using SOBQ; 5) to assess the concurrent validity of the instruments: PAR (Cheung, 2006; Hortz, 2005; Weston, Petosa & Pate 1997); and pedometer (Yamax, SW700, Japan). 6) Since only self-efficacy were found to be significant with SOBQ in Pilot Study One, present study further investigated the convergent validity of SOBQ (Heller, 2006) with physical activity data assessed by pedometer and actical in this special population. The findings of this Pilot Study Two served to consolidate the foundation for the main study.

**Methods**

**Design.** Pilot Study Two was conducted in June 2009 with an aim to collect detailed activity pattern of daily routine activities on seven consecutive days of female adults with ID working in Hong Kong sheltered workshop.

**Setting.** The Pilot Study Two was administrated at one agency (St. James Settlements) that served adults with ID.

**Sample.** This Pilot Study Two involved eight female volunteers. Adults over the age of 18 with mild to moderate ID, (N=8, Mean=41.37 years, SD=7.92), were recruited from St. James Settlements. Although IQ scores were not available, verification that the sample represented adults with mild to moderate ID was based on a centre supervisor's confirmation. It was short of manpower in sheltered workshop when conducting Pilot Study Two, during that busy day, supervisor in sheltered workshops only allowed few workers to participate in the Pilot Study Two. Only eight written consents from participants were obtained for the study; with the small sample size in Pilot Study Two, caution was needed when interpreting its results.

**Measures.** Physical activity behaviour was evaluated using Physical Activity Recall (PAR) (Cheung, 2006; Weston, Petosa, & Pate, 1997). Walking activity was

recorded by sealed pedometer (SW-700, Yamax) (See Chapter Two and Pilot Study One). Physical activity intensity was assessed by actical (Respironics, USA). Psychosocial behaviour was evaluated using SOBQ (Heller et al., 2006) regarding adult's self-efficacy, outcome expectation, barriers to exercise (See Chapter Two and Pilot Study One). Demographic information was collected using a simple, verbally administered questionnaire. Height, weight and waist circumference were measured by the test administrator with a standard tape measure and Physician scale for the calculation of BMI (Inoue et al., 2000).

***PAR.*** Detailed activity pattern of daily routine activities on seven consecutive days (PAR) (Cheung, 2006; Hortz, 2005; Weston, Petosa, & Pate, 1997) were collected in this study. Activities were divided into three categories: daily routine activity (such as change clothes, personal care, shower, meals, sleep, commuting, walking, housework, study) with 9 items, passive leisure activity (such as watching television, using computer, watching movie, playing TV game, reading books or newspapers, playing musical instrument, chatting, or talking on the phone) with 8 items and active leisure activity (such as ball games, running, cycling, dancing, physical fitness activities, water activities, shopping or playing in the park) with 8 items (See Appendix F). Pilot Study Two measured seven consecutive days of physical activity, a maximum of one bout of moderate physical activity continuously for 30 minutes was allowed for a participant each day by giving a score of one. A score of zero was given if a participant did not have one bout of MPA. The possible range of scores for PA was 0-7. A high score indicates more days engaged in moderate intensity physical activity (Hortz, 2005; Petosa, 2009; Winters, 2001).

***Pedometer.*** Pedometer was highly consistent and reliable for participants in adults with ID with intra-class correlation coefficients ranged from 0.89 to 0.97 (Pitchford & Yun, 2010) and .95. (Stanish, 2004). A t-test revealed no gender

differences in walking activity among adults with ID (Stanish, 2004).

***Actical.*** Physical activity intensity was assessed by actical (Respironics, USA), the criterion-related validity correlations (r) for the actical were 0.73 at the slow walk condition and 0.99 at the normal walk and run conditions for 9 to 59 years old normal population (Esliger, 2007). Physical activity intensity was shown in minutes within each category: sedentary (sleep or rest), light (sorting cards, writing letter), moderate (sweeping floors, vacuuming, dusting), and vigorous (treadmill walking 2.5 to 3.0 mph, treadmill jogging 4.5 mph) (Respironics, Inc., 2008).

***SOBQ.*** The reliability and test-retest correlation of self-efficacy, outcome expectation and barrier to exercise for adult with ID reported by Heller et al. (2006) were .91, .79, .73; 0.52 ($p<0.01$), 0.72 ($p<0.01$), 0.55 ($p<0.01$). From Pilot Study One conducted by the present investigator, the Pearson correlation coefficient between SOBQ and pedometer step counts were found to be statistically significant on self-efficacy with $r=.44$ ($p<0.01$). The Cronbach's alpha reliability has been used to test reliability of SOBQ, with good internal consistency of .81, .72, .70 on self-efficacy, outcome expectation and barrier to exercise, respectively. And the test-retest by intra-class reliability of SOBQ were .67, .78 and .71, respectively (See Chapter Two and Pilot Study One).

**Procedures.** Pilot Study Two was conducted in seven consecutive days (weekdays to weekend). The participants completed the SOBQ with face-to-face interview by the test administrator on the eighth morning before started work. Activity pattern, step counts and physical activity intensity on seven consecutive days from Monday to Friday (at work and after work), and Saturday and Sunday (non-working hour) were assessed by PAR, sealed pedometer and acticial respectively. The participants also completed the PAR with an interviewer face-to-face interview by the test administrator on each morning before participants started work and also after work.

The administrator also recorded the participants' wake-up time, bedtime, time to go to work, time to get off work, types of transportation, and activities during off-work hours. Step counts from pedometer were collected by test administrator on every morning before they started work and after work; while steps and physical activity intensity from actical were recorded in a log book on the eighth day. Test administrator distributed a sealed pedometer and actical to the participants before they started work. Both pedometer and actical were placed on the belt at the waist of the right side during waking hours except shower and swimming. Before data collection, a 30-step test and a 30-shake test (Vincent & Sidman, 2003), and a 4-day wearing trial were performed to test the pedometer's and the actical's accuracy and all the pedometers and actical had batteries replaced.

**Result**

**Demographics.** Eight female participants completed the Pilot Study Two with mean age=41.37, SD=7.92, ranged from 32 to 52 years old. (See Table Eight). They lived in HK East (62%), Wan Chai (25%), and HK South (13%) and most of them used transportation (82.53) and they did not need any special aids. Most of the participants' education levels were below Form 3 (junior high school) (49%) and did not have any regular training (62%), e.g. Special Olympic in secondary school. Mean value for height was 154 cm (SD=6.25), mean weight: 65 kg (SD=14.28); mean BMI: 27 kg/ $m^2$ (SD=4.98) and the mean waist circumference: 34.6 inches (SD=3.58). The study of Hong Kong Chinese worker in 2007 (Ko et al., 2007) with 3,769 (1,513 in 1990 and 5,882 in 2007) female workers showed that the mean values for age, BMI, and waist circumference for women adult Chinese workers in 1990 were: 42.1 years, BMI: 22.7 kg/ $m^2$, waist circumference: 74.9 cm respectively; and that in 2007 were: 38.6 years, BMI: 23.3 kg/ $m^2$, waist circumference: 74.9 cm respectively. In this study,

the female participants with mild ID for adults had the same mean age with normal female workers of the general population, but with higher BMI and waist circumference (See Table Eight). Comparing BMI and waist circumference of working females in the general population in 1990 and 2007, the differences were small (Ko, 2007). Although the waist circumference between 1990 and 2007 remained stable in female workers of the general population, and the BMI was slightly higher than that in 2007, female participants with mild ID still had a higher BMI and waist circumference comparing to female workers of the general population in 1990 and 2007.

Table 8.

Anthropometric data of Eight Females with Mild to Moderate Intellectual Disabilities (Mean, SD)

| Variable | Mean | SD |
|---|---|---|
| Age | 41.37 | 7.92 |
| Height (cm) | 154 | 6.25 |
| Weight (kg) | 65.29 | 14.28 |
| BMI ($kg/m^2$) | 27.21 | 4.98 |
| Waist Circumference (inches) | 34.62 | 3.58 |

**Lifestyle - Time Distribution of 7 Days Measured by PAR.** The activity distribution (daily routine activity, passive leisure activity, active leisure activity) measured by PAR on working days and holidays (non-working days) was different. Results showed that the mean working hours per day was 7.6 hours, which accounted

for 31.52% of the total time in 7 days. On working days, participants spent 81.51% on daily routine activity during their non-working hours, like personal care, shower, meals, sleep, housework, study, commuting, walking; 15.27% of the time on passive type of leisure activities which were more sedentary like watching television, using computer, watching movie, playing TV game, reading books or newspapers, playing musical instrument, chatting, or talking on the phone; 3.23% of the time on active type of leisure activities like ball games, running, cycling, dancing, physical fitness activities, water activities, shopping or playing in the park. On non-working days, participants spent 79.78% on daily routine activity; 18.03% of the time on passive type of leisure activities; 2.19% of the time on active type of leisure activities. Comparing working days to non-working days, results showed that participants spent more time on passive type of leisure activity in non-working days, and less time on daily routine activities and active type of leisure activities in non-working days (See Table Nine). Comparing with the leisure activities among person with disability (mental handicap, physical handicap, visual impairment, and hearing and speech impairment) reported by Fu (1996) with 480 participants ranging from 7-66 years old, in which participants spent only 2.2 hours/week on physical activity; the current findings presented a far worse picture, as participants of this study spent less time, only 0.39 hours/week on active leisure activity.

Table 9.

Working Hours and Physical Activity among Eight Females with Mild to Moderate Intellectual Disabilities (%)

| Variable | Working day (%) | Non-Working day (%) |
|---|---|---|
| Physical Activity (% of time spent in a day): | | |
| Daily Routine Activity | 81.5 | 79.78 |

| | | |
|---|---|---|
| Passive style of leisure activity | 15.27 | 18.03 |
| Active style of leisure activity | 3.23 | 2.19 |

**Step Counts Measured by Pedometer.** Physical activity data of pedometer on step counts appear to be sufficiently normally distributed on mean step on working days (skewness = 1.2, kurtosis = 0.0), mean step on non-working days (skewness = 0.0, kurtosis = 1.2), and mean step for 7 days (skewness = 0.2, kurtosis = 0.1) (Kline, 2005); therefore, parametric statistical tests were used in this pilot study. Results showed that the daily mean step counts on working days was 7,384.15 (SD=2971.92) and the daily mean step count on non-working days was 6,865.89 (SD=2213.89). Result also showed that the non-working days daily step counts had a slight decrease when comparing the daily mean step on working days (Mean=7,384.15, SD=2,971) with the daily mean step on non-working days (Mean=6,865.89, SD=2,213.83). The total daily mean step in a week (7 days) was 7,260.71 (SD=2,600.43). Findings indicated that working adults with ID did not participate in enough physical activity (10,000 steps/day) (Stanish, 2005) on working days or non-working days (See Table Ten).

Table 10.

Working Hours and Step among Eight Females with Mild to Moderate Intellectual Disabilities (Mean, SD)

| Variable | Working Day | | Non-Working Day | | Total Mean on 7 Day | |
|---|---|---|---|---|---|---|
| Physical Activity (Daily): | Mean | SD | Mean | SD | Mean | SD |
| Step | 7,384.15 | 2971.9 | 6,868.89 | 2213.8 | 7,260.71 | 2,600.43 |

**Physical Activity Intensity Measured by Actical.** The cut-point of minutes in

physical activity intensity categorized into: sedentary, light, moderate, and vigorous were generated by the actical (Respironics, 2008). The actical readings showed that during working days, participants spent 76.63% of the time in sedentary activity, 11.73% in light activity, 8.25% in moderate activity, and 0.01% in vigorous activity. On non-working days, participants spent 88.30% of the time in sedentary activity, 11.41% in light activity, 8.05% in moderate activity, and 0.03% in vigorous activity (See Table 11). Again, results showed that adults with ID spent most time on sedentary and light activity such as sleep or rest in sedentary activity, and sorting cards or writing letter in light activity (Respironics, Inc., 2008). The percentage of physical activity intensity (min) on: working day (Mean=1,077.83, SD=105.22); non-working day (Mean=1,088, SD=111); and averaging on 7 days (Mean=1,092.14, SD=78.08) showed that adults with ID spent most of the time on sedentary activity (sleep or rest). While the second most of the time in light activity (min) (sorting cards or writing letter) with result of: working day (Mean=173.66, SD=49.37); a non-working day (Mean=164.02, SD=39.53); and averaging on 7 days (Mean=158.55, SD=48.290) (See Table 12). Findings showed that the percentage of physical activity intensity spent on sedentary activity (sleep or rest) was higher on non-working days than working days. The result was in line with the studies from Yen (2010) and Fu (1996) that individuals with disabilities spent most of the time on sedentary activities.

Table 11.

Working Days and Physical Activity Intensity among Eight Females of Mild to Moderate Intellectual Disabilities (%)

| Variable | Working Days (%) | Non-Working Days (%) |
|---|---|---|
| Physical Activity (% spent per day): | | |
| Sedentary | 76.63 | 88.30 |

| | | |
|---|---|---|
| Light | 11.73 | 11.41 |
| Moderate | 8.25 | 8.05 |
| Vigorous | 0.01 | 0.03 |

Table 12.

Working Days and Physical Activity Intensity (min) among Eight Females of Mild to Moderate Intellectual Disabilities (Mean, SD)

| Variable | Working Days | | Non-Working Days | | Total Mean on 7 Days | |
|---|---|---|---|---|---|---|
| Physical Activity (Minutes/Day ): | Mean | SD | Mean | SD | Mean | SD |
| Sedentary | 1077.83 | 105.22 | 1088 | 11.07 | 1092.14 | 78.08 |
| Light | 173.66 | 49.37 | 164.02 | 39.53 | 158.55 | 48.29 |
| Moderate | 120.63 | 29.52 | 119.64 | 24.55 | 116.60 | 31.81 |
| Vigorous | 0.02 | 0.07 | 0.66 | 1.23 | 0.19 | 0.39 |

**The Psychosocial Aspect Measured by SOBQ.** Psychosocial data of SOBQ appear to be sufficiently normally distributed on self-efficacy (skewness = 0.0, kurtosis = 2.0), outcome expectation (skewness = 1.7, kurtosis = 0.7), and barrier to exercise (skewness = 2.4, kurtosis = 6.5) (Kline, 2005); therefore, parametric statistical tests were used in this pilot study. In terms of the psychosocial aspect, 3-point Likert scale from 1 (not at all sure) to 3 (totally sure) was used in the SOBQ, ID workers' physical activity attitude towards self-efficacy was of mean=7.0 (SD=1.69); outcome expectation was of mean=12.88 (SD=5.87); and barrier was of mean=15.0 (SD=2.51). Data showed that barrier to exercise and outcome expectation

among adults with ID were of average values, while self-efficacy was quite low (See Table 13). When compared with the Pilot Study One, results were quite similar that self-efficacy was the lowest.

Table 13.

Psychosocial Aspect towards Physical Activity among Eight Females with Mild to Moderate Intellectual Disabilities (Mean, SD)

| Variable | Mean | SD |
|---|---|---|
| Self-efficacy | 7.00 | 1.69 |
| Outcome expectation | 12.88 | 5.87 |
| Barrier to exercise | 15.00 | 2.51 |

**Correlation between Variables.**

***PAR.*** From this Pilot Study Two, the concurrent validity of PAR (active PA in workday) was estimated against pedometer step counts (mean step in 7 days) and actical (mean minutes of PA in 7 days) ranging from r=.72 to r=.77, and the result showed good internal consistencies, with Cronbach alpha coefficients reported to be .92, .78, .89 on daily routine activity, passive leisure activity, and active leisure activity, respectively.

***Pedometer.*** The correlation coefficient between pedometer step counts (mean step in 7 days) and actical physical activity intensity (mean minutes of PA in 7 days) was strong, ranging from r=0.90 to r=0.98 indicating good concurrent validity for the pedometer data.

***SOBQ.*** The convergent validity between SOBQ: self-efficacy, outcome expectation and barrier, and actical (mean minutes of PA in 7 days) and pedometer

(mean step in 7 days) were found to be in a good correlation (Pallant, 2007). The correlation coefficient against actical with self-efficacy, outcome expectation and barrier were r=0.80, r=0.83, r=-0.90, respectively. While correlation coefficient against pedometer with self-efficacy, outcome expectation and barrier were r=0.71, r=0.76, r=-0.81, respectively.

**Discussion**

In the present Pilot Study Two, adult workers with ID's mean step counts recorded on working days was 7,384.15 (SD=2,971.9), mean on non-working days was 6865.89 (SD=2,213.8), and mean of 7 days was 7,260.71 (SD=2,600.43), in which all measures were below the recommended 10,000 steps per day. The large SD of the step counts in Pilot Study Two could be explained by different health conditions and the participant's place of abode. Some of them commuted by shuttle bus (38.09%), public transport (44.44%) or on foot (17.46%). Results were supported by a similar mean weekly step counts in Stanish's study (2005), that was 58,321 ± 26,896 and only 21.4% of the participants recorded 10,000 steps/day (Stanish, 2005). In terms of walking, the result of low activity level was in line with a large population study which reported only one third or fewer were sufficiently active to meet the health promotion guidelines for physical activity (Temple et al., 2006).

In fact, data illustrated that the non-working hour's activity resembling very much a sedentary lifestyle accounts for 81.51% of daily activity (such as, change clothes, personal care, shower, meals, sleep, commuting, walking, housework, study) and 15.27% of passive leisure activity (such as, watching television, using computer, watching movie, playing TV game, reading books or newspapers, playing musical instrument, chatting, or talking on the phone). Results showed that active leisure activity (such as, ball games, running, cycling, dancing, physical fitness activities,

water activities, shopping or playing in the park) was not enough for people with ID no matter on working or non-working days.

The concurrent validity of PAR (active PA in workday) and pedometer (mean step in 7 days) and actical (mean minutes of PA in 7 days) showed strong correlation. While the PAR showed good internal consistencies on daily routine activity, passive leisure activity and active leisure activity respectively. The results showed that PAR is a valid tool for measuring PA (Cheung, 2006; Hortz, 2005, Petosa, 2009; Weston et al., 1997; Winters, 2001) and the concurrent validity in this study indicated that it is suitable for people with ID.

The correlation coefficient between pedometer step counts (mean step in 7 days) and actical physical activity intensity (mean minutes of PA in 7 days) was strong. The result was in line with Esliger (2007) which showed that pedometer was a high validity device for measuring physical activity of people with ID (Esliger et al., 2007). Furthermore, SOBQ was valid and reliable as an outcome measure, which was in line with Heller et al. (2006), to be used for intellectual disabled population for the main study. Results showed that there were positive relationship on self-efficacy and outcome expectation with PA; while negative relationship on perceived barrier and PA. To conclude, PAR, pedometer and SOBQ are valid and reliable tools as process or outcome measures to be used for ID in the main study.

**Limitation.** There were few limitations in this Pilot Study Two. The design involved females only without any male participants. With the limitation from sheltered workshop and limited devices of actical, only eight females were recruited in the study. Although data was checked and appeared to be normally distributed, it should be interpreted with caution because of the small sample size. With the small sample size, the majority of the participants were found to be in older age range. Further study should select both sexes to determine any sex difference and also

included younger adults in the target population.

**Significance.** Pilot Study Two further ascertains validity and reliability of PAR and pedometer to measure physical activity and SOBQ to measure psychosocial behaviour among adults with intellectual disabilities in Hong Kong. The study showed that physical activity and psychosocial aspects toward physical activity were related. Besides, Pilot Study Two revealed that adults with ID in Hong Kong sheltered workshop did not have enough physical activity. Therefore, research purpose in the main study focused on applying physical activity intervention program to help increase physical activity for adults with ID.

## Main Study

### Purpose of study

The present research aimed to evaluate the effects of a twelve-week SCT-based intervention with pre and posttest control trials design aiming at increasing the frequency of moderate physical activity among adults with ID in worksite and enhancing their psychosocial perception towards physical activity participation. Physical activity participation is beneficial to health and its promotion is particularly important for adults with ID, who tend to engage in sedentary lifestyles. The main purpose was to evaluate the effectiveness of the twelve-week intervention with regard to psychosocial behaviour using SCT and physical activity behaviour among adults with intellectual disabilities.

No study had been explored in Hong Kong on PA intervention programme among adults with ID in worksite, the significance of the present study was conducting an intervention programme for adults with ID particularly in sheltered workshop. The uniqueness of the present intervention programme was to implement psychosocial behaviour towards PA among adults with ID based on SCT in Hong Kong sheltered

workshop.

## Methods

**Design.** The present study was conducted in February 2011 with an aim to enhance physically activity for adults with ID in worksite, a twelve-week intervention programme was designed with a four-week follow-up test on short term adherence of the SCT-based intervention programme.

**Setting.** Participants in intervention group were encouraged to reach the recommended activity level of 10,000 steps/day (Stanish, 2005) with the pre-set goal as process measure on each lesson and they attended a tailored-made lesson in one-hour per week; while participants in the control group did not attend any lessons or took step goal assessments and they worked as usual in the same worksite as the participants in the intervention group.

**Sample.** There were 29 participants in intervention group and 30 participants in control group during the twelve-week intervention programme. In the four-week follow-up test, due to the busyness of the sheltered workshop, only participants from intervention group were assessed. Participants were removed from the data set if they were missing either pre-test or post-test. In the twelve-week intervention programme, 11 participants were removed from intervention group and 10 were removed from control group. After handling the missing data, 59 participants with completed data (intervention group, n=29 and control group, n=30) were analysed.

**Measures.** SOBQ was used to evaluate psychosocial aspect of the participants (ID) which was a modified BIQ from Heller's HHPRP (2006). The present study adopted the same scale as Heller's HHPRP on self-efficacy, outcome expectation, barrier to exercise, and each subscale total score on both data were calculated by adding scores of items categorized by the subscale; therefore, the results of the present

study were used to compare with the results from HHPRP (Heller, 2006). PAR was used to evaluate the physical activity aspect of the participants.

**Participants**

In this main study, adults over age of 18 years were recruited from the St. James Settlement sheltered workshop in Hong Kong. The St. James Settlement had about 150 workers, over 90% of whom were intellectually disabled. They came from different areas of Hong Kong and the nature of their duty at the settlement was mainly desk job, for example, mail processing. They were under the guidance of ten supervisors, each of whom had at least ten years of experience working with adults with ID. For the present intervention programme, the inclusion criteria of participants were: no regular exercise habits, mild and moderate grade in intellectual disabilities and approval to participate from their parents and site physician with consent forms signed. All participant assigned a number and they were then randomly divided into an intervention group (N=40), and a control group (N=40) such that the number of participants in both groups remained the same (See Figure 2). A participant was removed from the data set if he/she had missed or had not completed the posttest; he/she would also be removed if attendance was lower than 80%.

The Physical Activity Readiness Questionnaire (PAR-Q) was administered to all participants to screen for any disease or musculoskeletal problems. Written consents (See Appendix A) from their parents or guardians were obtained before conducting the study. Approval was sought from Ethic Committee of Hong Kong Baptist University (See Appendix B) before data collection. Before the commencement of the study, height, weight and waist circumference were measured by the test administrator with a standard tape measure and Physician scale for the calculation of BMI (Inoue et al., 2000).

**Calculation of Sample Size based on Power**

Before the implementation of the intervention, sample size was determined for the detection of the treatment effect anticipated. To determine the sample size, a statistical power priori analysis G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) was used. Information needed for the calculation of sample size was the desired level of power, alpha level, and effect size. Desired power was set at .80 as recommended by Faul et al. (2007); a priori alpha for this present study was set at .05. This was in line with convention within the social science research area, and 0.75 (Faul et al., 2007) was used as a medium level of effect size to calculate treatment effect needed in the power calculations. After the calculation, 29 participants were needed for each control and intervention group, making the total sample size of 58. In the present study, in case of drop out participants, 40 participants were recruited for each group to ensure that there were enough participants for the study.

**Criteria for Inclusion**

Only adults with mild to moderate grade intellectual disabilities who had completed consent form and whose parents had completed parental consent form was included in the study. Since the participants' presence was a pre-requisite for their exposure to the treatment, only those in the intervention group who had attended eighty per cent of the lessons and completed the posttest was examined in the final analysis. Participants whose movements were limited by injury or severe physical disabilities were excluded. Although IQ scores were not available, verification that the sample represents adults with mild to moderate intellectual disabilities was based on a centre supervisor's confirmation and then randomly selected to participate in this study.

**Intervention Content and Process**

This twelve-week physical activity intervention was based on the Social Cognitive Theory (SCT) (Bandura, 1986). The intervention group lessons had been designed to aim at delivering knowledge to enhance self-efficacy, outcome expectation, and barrier towards physical activity participation, these being the three constructs of the main study, which was based on review of literature (See Chapter Two). Knowledge was delivered through the baseline fitness knowledge such as principles of fitness, the health benefits of physical activity, etc. Self-efficacy was delivered through lessons about overcoming barriers to physical activity, behavioral mastery experiences, and discussion groups. Outcome expectations were delivered through lessons about goal setting, exercise perception, planning ability, physical and self-evaluative aspects of outcome expectancies. Barrier was delivered through received incentives based upon achieving behavioral goals they set for themselves. The SCT intervention programme contents were designed based on Bandura (Bandura, 1986), Health and Health Promotion Research Projects (Heller, Marks, & Sisirak, 2006), Path to Leisure Physical Activity among Adults with Intellectual Disabilities (Peterson et al. 2008), The Healthy Lifestyle Change Programme (Bazzano et al. 2009), Healthy Athletes (Pastorfield, 2005) and Healthy Lifestyles (Abdullah et al., 2004), which have been discussed in Chapter Two.

In order to achieve curricular goals, the lessons were developed through a pilot trial by four full time staff members at a sheltered workshop, the test administrator of the present study, and the present investigator in February 2010. Two of the staff members were social workers and two were vocational therapists; and all four of them were familiar with the sheltered workshop and the workers with intellectual disabilities. They all had an average of ten years of working experience with people

with intellectual disabilities and were responsible for the workers' working activity and behaviour. Moreover, their advice was valuable because they had developed trust among the ID workers. The test administrator also had substantial knowledge and experience on ID population pedagogy of over thirty years. The purpose of this trial was to test the timeline and to ensure that the curriculum was feasible and could be effectively delivered.

Ten adults with mild to moderate grade ID from St. James settlement who were not participants of this main study were tested for four sixty-minute lessons which had been designed by the present investigator. Before each trial lesson, the present investigator had a meeting with the four staff members and the test administrator in order to explain the purpose of the present investigation and the content of the curriculum. The timeline of the lessons was then modified and improved by the six evaluation panel members. Two of them (full time staff A and B) were invited to provide feedback on the curricular processes and lesson delivery, after which, one of the full time staff members (C or D) was given the lessons to use in class. Further refinements on timeline and lesson delivery were then made according to the full time staff members' (A, B) comments. Two full time staff (C, D) then used the refined version in class and gave further comments for improvement. Through this process the curriculum had been polished for the purpose of the main study. Then the test administrator used the curriculum to conduct the twelve-week intervention programme. Another group of ID workers was recruited as participants in the main study.

In the main study, eligible participants of the St. James Settlement were assigned a number and then randomized into control group and intervention group to assure that personal characteristics were equally distributed within the groups. Participants from intervention group were invited to participate in the intervention programme by taking a sixty-minute class per week on each consecutive Saturday for twelve weeks (See

Appendix C). The test administrator who had been involved in the curriculum trial and who had expertise in working with adults with ID was recruited from the workshop on a voluntary basis. Two test facilitators, major in treatments for special populations at the Hong Kong Baptist University, were also recruited on a voluntary basis to assist the test administrator in lesson delivery. The advantages of recruiting these experts were that they were familiar with the participants in the workshop and they had developed mutual trust and understanding with the participants.

Both the test administrator and facilitators received a briefing before the beginning of intervention in week zero. An assessment sheet (See Appendix D) was completed by the present investigator to ensure that the intervention programme contents had been implemented properly by the test administrator. Pretest and posttest questionnaires, namely the Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ) (See Appendix E) and Physical Activity Recall (PAR) (See Appendix F) were administered at week zero (pretest) and at week thirteen (posttest) in both control and intervention groups. Participants completed the SOBQ and PAR with a face-to-face interview by the test administrator.

Participants in the intervention group received the SCT-based physical activity intervention programme. The following section outlines the curriculum that the intervention group received. Participants in the intervention group were asked to engage in mastery experiences that aimed to adjust their ability to deal with barriers to activity and their perceptions of the outcomes of physical activity. Lesson zero was the pretest assessment day and the last lesson in week thirteen was the posttest assessment day for both control group and intervention group (See Appendix C for lesson contents).

**Curriculum Contents**

**Lesson 0 – Pretest and briefing session for physical activity intervention.** One week before the intervention programme, there was a briefing for the participants and their parents/caretakers about the intervention contents so as to ensure that both participants and their parents/caretakers understood the intervention treatment. A consent form and a Physical Activity Readiness Questionnaire (PAR-Q) were delivered so that the signed consent form and PAR-Q could be collected before the beginning of the intervention. After collecting all the PAR-Q and signed consent forms, participants were measured for their heights and weights for the calculation of BMI and waist circumference, and participants were randomly assigned to intervention and control group. Participants were then asked to fill out a face-to-face administrated questionnaire: the self-efficacy, outcome expectation, barriers to exercise instruments - the Chinese version of the baseline interview questionnaire (SOBQ) (Heller et al., 2004). The test administrator then collected the SOBQ and introduced the log book including the Physical Activity Recall (PAR) (Weston et al., 1997; Hortz, 2005) and step counts form, and delivered the sealed pedometer (SW-700 Yamax, Japan) to assess physical activity levels. Pedometer step counts were recorded for five consecutive days (Monday to Friday). Participants in the intervention group were asked to wear the sealed pedometer everyday. (Description of data collection of pedometer would be described under the “Use of Pedometer” section).

**Lesson 1 - Introduction to programme**. After taking the attendance, test administrator discussed with participants about what physical activity was. Participants were then asked to write down what they considered as physical activity as much as possible in the log book. After creating this list, participants commented on the list and discuss what should be considered as physical activity. Test administrator then wrapped up the discussion by telling the participants a correct understanding of

what physical activity should be and recorded each participant's step counts per day in their log book from week zero to week one.

**Lesson 2 - Exercise benefits.** After taking the attendance, test administrator had a revision with participants on what physical activity was and led a discussion of exercise benefits and barriers. Participants wrote down how they felt after exercise in their log books. After creating this list, participants then commented on the list and discussed with test administrator about positive and negative feelings towards exercise. Test administrator then wrapped up the discussion of exercise benefits and barriers and wrote down each participant's step counts per day in their log books from week one to week two.

**Lesson 3 – Exercise barriers**. After taking the attendance, test administrator had a revision with participants on exercise benefits and barriers and introduced the concept of a 10,000 steps of walking for health. Participants discussed their changes of step counts in the previous two weeks and identify step goals. Test administrator then instructed them on the preparation before exercise and led a discussion of exercise barriers. Test administrator then wrote down each participant's step counts per day in their log books from week two to week three.

**Lesson 4 – Exercise opportunity.** After taking the attendance, test administrator had a revision with participants on exercise barriers and identify exercise opportunities in particular environments. Participants wrote down what exercise they liked and where they did exercise in the log book. After creating the list, test administrator discussed possible exercise venues with the class. Test administrator wrote down each participant's step counts onto their log book and identified their step goals and changes on steps taken in the previous four weeks. Test administrator wrapped up by setting step goals.

**Lesson 5 – Self-monitoring.** After taking the attendance, test administrator had a

revision with participants on step goals and led a discussion on meeting physical activity goals. Test administrator started to check each participant's log book about the daily step goals and encouraged them to reach the goals. Verbal persuasion was used in this session and test administrator helped participants to create new goals according to each particular participant's step records. Test administrator then wrapped up by discussing the elimination of exercise barriers.

**Lesson 6 - Goal attainment.** After taking the attendance, test administrator had a revision with participants on activity goals and asked participants to write down what kind of physical activity they had participated in their log books. Test administrator then led a discussion on meeting physical activity goals, goal attainment and barriers. After discussion, test administrator wrote down the steps taken of the previous week onto each participant's log book, and reviewed the stages of change of the steps taken. If the goal was met, test administrator had a discussion on how to achieve adherence to exercise, goal-setting, reinforcement, plan to overcome barriers, and discuss goal-setting concepts emphasizing the evaluation of goals to make sure the participants meet criteria of a good goal. Participants was then set a new goal.

**Lesson 7 - Reasons to exercise.** After taking the attendance, test administrator checked with participants on activity goals and asked participants to write down how they felt after participating in physical activity in their log book. Test administrator then led a discussion of reasons to exercise, benefits of exercise and the elimination of exercise barriers. Test administrator reviewed the stages of change of the steps taken in each participant's log book. If the goal was met, test administrator had a discussion on how to achieve adherence to exercise, reinforcement, goal-setting, plan to overcome barriers, and make sure they had met the goal. Participants were then asked to attain or set a new goal according to the record from the log book.

**Lesson 8 - Exercise barriers.** After taking the attendance, test administrator reviewed the reasons to exercise and checked with participants on activity goals. Participants wrote down how they felt after participating in physical activities in their log books. Test administrator then led a discussion on eliminating barriers of exercise. Test administrator reviewed the stages of change of the steps taken in each participant's log book. If the goal was met, test administrator led a discussion on how to achieve adherence to exercise, reinforcement, goal-setting, plan to overcome barriers, and make sure the subjects had met the goals. Participants would then be asked to attain or set a new goal according to the record from the log book.

**Lesson 9 – Exercise difficulties.** After taking the attendance, test administrator checked with participants on activity goals. Participants then wrote down what difficulties they had faced when participating in physical activities in their log books. Test administrator led a discussion of eliminating barriers of exercise. Test administrator reviewed the stages of change of the steps taken in each participant's log book. If the goal was met, test administrators led a discussion on how to achieve adherence to exercise, reinforcement, goal-setting, plan to overcome barriers, and made sure they had met the goal. Participants were then asked to attain or set a new goal according to the record from the log book.

**Lesson 10 – Other types of physical activity.** After taking the attendance, and test administrator checked with participants on activity goals. Participants wrote down some other different types of physical activity in their log books. Test administrator led a discussion of different physical activities and asked participants to set a new activity goal. Test administrator then reviewed the stages of change of the steps taken in each participant's log book. If the goal was met, test administrators had a discussion of how to achieve adherence to exercise, reinforcement, goal-setting, plan to overcome barriers, and made sure they met the goal. Participants were asked to attain or set a

new goal according to the record from the log book.

**Lesson 11 – Goal attainment.** After taking the attendance, test administrator checked with participants on activity goals. Participants wrote down some barriers when having a new physical activity in their log book. Test administrator then led a discussion on eliminating barriers of physical activity. Verbal encouragement was used in this session. Test administrator then reviewed the stages of change of the steps taken in each participant's log book. If the goal was met, test administrator rewarded participants with small gifts (e.g. sticker), and follow up with a discussion on how to achieve adherence to exercise, reinforcement, goal-setting, plan to overcome barriers, and ensure they met the goal. Participants were asked to attain or set a new goal according to the record from the log book.

**Lesson 12 - Achieving goal.** After taking the attendance, test administrator checked with participants on activity goals. Participants shared their experience of participating in physical activities. Test administrator then wrapped up by discussing health, reasons and benefits to exercise, elimination of exercise barriers, stages of change and life-long exercise, based on the experience from previous weeks. Test administrator reviewed the stages of change of the steps taken in each participant's log book, and rewarded them with small gifts.

**Lesson 13 – Posttest.** Participants were asked to fill out the administrated questionnaires (assessment instruments), which were the self-efficacy, outcome expectation, barrier to exercise instruments –Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ) (Heller et al., 2004); and the Physical Activity Recall (PAR) (Cheung,2006; Hortz, 2005; Weston et al., 1997). Measurements of height and weight were also taken for the calculation of BMI and waist circumference. A certificate was awarded to every participant who had at least 80% attendance in class and had participated in both pretest and posttest.

**Process Measure**

Pedometer and set goals were used in the process measure for the participants in the intervention group. According to the SCT (Bandura, 1986), outcome expectancies were built up through goal-setting. Studies had also shown that, without the use of step goal, there was no significant improvement in physical activity with pedometer (Izawa, 2005; Ornes, 2005; Ransdell, 2005). A step goal of 10,000 steps/day was targeted throughout the intervention programme. The purpose of process measure was to ensure that the participants in the intervention group could reach a step counts of 10,000/day by week 12 (Croteau, 2004). Pedometer data of the participants' daily steps taken were recorded by facilitators (See Appendix G) and participants were informed about their average steps in the previous week recorded together with the assigned goal of daily steps in order to help the intervention group achieve a minimum of 10,000 steps/day.

**Use of Pedometer.** Before data collection, pedometers were checked for accuracy by a 30-step test and 30-shake test (Vincent & Sidman, 2003) and all the pedometers had batteries replaced. Sealed pedometer (SW-700 Yamax, Japan) was used to examine the daily steps. In order to avoid participants' reactivity, sealed pedometers were administered to both intervention and control groups, and the record of steps taken at pretest and posttest (Welk, 2002).

On the other hand, pedometer and set goals were used as a process measure for the participants in the intervention group, and pedometer step counts were recorded throughout the whole intervention period for five consecutive days (Monday to Friday) (Hilgenkamp et al., 2012) with participants wearing a sealed pedometer on their right waist during waking hours except shower and swimming. The test administrator distributed the sealed pedometer every morning before participants

started to work and collected the pedometer when participants were off work; and another sealed pedometer were given to participants to record step counts after work, which was returned the next morning before they started to work. In this way the step counts and activity data were recorded onto the log book by the test administrator twice a day.

**Set Goals.** Step goals (Croteau, 2004; Stanish, 2005; Tudor-Locke & Bassett, 2004) were set and participants in the intervention group were given these goals. Step goal was designed as: if having <8,000 daily steps at baseline, then 10% increase would be set over baseline every 2 weeks until > 10000/d; if having 8000-10,000 daily steps, then increase by 5% would be set every week until >10,000/d; if having baseline ≧ 10,000, then participants were told to maintain the present physical activity level. The goal was to build up to 10,000 steps/day by week 12 (Croteau, 2004; Stanish, 2005; Tudor-Locke & Bassett, 2004), which was applicable only for the intervention group but not the control group. All participants were verbally encouraged to achieve set goals while small gifts such as sticker, were awarded to the participants who had reached the set goals.

**Outcome Measures**

Two outcome measures were used in the present study: Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ) with items extracted from BIQ (Heller et al., 2006) and Physical Activity Recall (PAR) (Hortz, 2005; Weston et al., 1997). These measurement tools are scales that examine, respectively, a) psychosocial aspects of physical activity among adults with ID and b) the assessment on physical activity levels. For the measurement of the psychosocial aspects, SOBQ including self-efficacy, outcome expectation and perceived barriers (Heller et al., 2004) were adopted as it was purposefully designed for adults with mild to moderate grade

intellectual disabilities. As for the assessment on physical activity levels, PAR was used. The feasibility, reliability, and validity of both SOBQ and PAR had been determined by the two pilot studies. Results from the pilot studies showed that both SOBQ and PAR were valid and reliable (See Chapter Two, Pilot Study One and Two).

**Measuring psychosocial variables by modified SOBQ.** Chinese version of SOBQ instrument was not available. A translation procedure (translated and back-translated) was undertaken based on Hambleton and Kanjee's description (Hambleton & Kanjee, 1995). After the translation and back-translate process, content validity of the SOBQ was evaluated by two language teachers, who had an average of 10 years working experience in special school and major in Chinese. They were invited to check and amend the wordings of the SOBQ and the verbal rendering of the items in SOBQ for the face-to-face interviews with the participants. (See Pilot Study One)

***Self-efficacy.*** The Self-efficacy scale contained 5 items concerning the confidence that one had in performing exercise, including being able to use various kinds of exercise equipment and feeling comfortable performing strength and cardiovascular exercises. Confidence was rated on a continuum from 1 (not at all sure) to 3 (totally sure). The possible range of scores for self-efficacy was 1-15. A high score indicates a high level of confidence to overcome physical activity barriers (Heller et al., 2001).

***Outcome expectation.*** Outcome expectation scale included 9 items: controlling weight, feeling less tired, making body feel good, feeling happier, hurting less, meeting new people, getting in shape, looking better, and improving health. Instrument measures on a 3-point Likert scale. The possible range of the scores for outcome expectation was 1-27. A high score indicates higher expectation on physical

activity would do to participant (Heller et al., 2001).

***Barrier to Exercise.*** Barriers scale included 9 items about barriers towards exercise participation. The barriers included lack of time, interest, and energy; and the perception that exercise was boring, not being able to improve condition, making condition worse, being too difficult, having health concerns, and just being too lazy. It was rated on a 3-point Likert scale from 1 (not a barrier) to 3 (yes, a barrier) for the person with ID. The possible range of the scores for barrier to exercise was 1-27. A high score indicates higher barrier on physical activity (Heller et al., 2001).

***SOBQ Scoring.*** Psychosocial behaviour in terms of self-efficacy, outcome expectation, and exercise barrier was measured with 3-point Likert scale from 1 (low score) to 3 (high score), which was high; and 1 very low. For example, a participant scoring 3 for self-efficacy means that he/she had strong belief in his/her ability to execute a course of action. But if a participant scoring 3 for barrier to exercise, it means that he/she faced a maximum amount of obstacles to take a course of action. Final scores were the sums of items within each subscale in SOBQ.

**Measuring physical activity variables by PAR.** The validity and reliability of PAR had been previously established (Cheung,2006; Hortz, 2005; Weston et al., 1997) and PAR was used to indicate the physical activity intensity in a day.

***Physical Activity Recall (PAR).*** The PAR required participants to recall the previous days of physical activity participation from 7:00 to 12:00 mid-night. Each day was segmented into eighteen 30-minute time blocks. For every 30-minute block, participants were told to report the main activity referenced from an activity list, which consisted of 25 commonly performed activities. Then the participants checked the intensity level (e.g. light, moderate, or vigorous) associated with the activity. In order to assist participants to accurately fill in the recall, the PAR was characterized

by: (1) the 30-minute blocks were grouped into broader time periods (e.g. before work, after work, dinner time and evening), (2) the activity list was grouped into broad categories which were: daily routine activity, passive, and active leisure activity, and (3) a graphic illustration was presented to express the meaning of relative intensity. Based on the activity code and the intensity code, a bout in each of the eighteen 30-minute time blocks was recorded (Ainsworth et al., 2000).

***PAR Scoring.*** Physical activity behaviour in terms of moderate physical activity was measured. Winters (2001) stated that there were criteria for an activity to be considered an evaluable form of physical activity, based on the appropriate selection process of the PAR: a bout of physical activity must be of medium intensity, and must be engaged in for at least fifteen minutes continuously within the 30 minutes MPA. Organized sport participation was not counted as physical activity; only volitional act was considered appropriately analyzable; and the bout of activity should take place before or after work and was rated as medium intensity. Activities listed in the PAR activity listing page included all analyzable selections within the play/recreational or exercise/workout category. According to the criteria stated in the PAR, the participant should enter an intensity of "medium" on the log sheet if he/she had a bout of moderate physical activity. Since the present study measured days of physical activity, a maximum of one bout of moderate physical activity was allowed for a participant each day (Hortz, 2005, Petosa, 2009, Winters, 2001). The range of integers allowed for the dependent variable of moderate physical activity was 0-5, signifying the number of days in a week (Monday to Friday).

Weekend data could not be collected due to practical constraint that some of the participants need to work on Saturday, but some need not; and St. James settlement was closed on Sunday. From the Pilot Study Two, findings showed that the variation of physical activity level between weekdays and weekends among adults with ID was

not high. The present study collected data of physical activity level before work (8am) and after work (4pm) on five consecutive weekdays only (Monday to Friday). Besides, vigorous physical activity was not included in the final analysis because results from Pilot Study Two showed that none of the participants could achieve vigorous physical activity (0 days a week of vigorous exercise).

**Scale Characteristics of the Questionnaires.** This section was a summary of the questionnaires used for evaluating the theoretic constructs in this study. The validity and reliability were reported and constructed for SOBQ and PAR.

***Validity and reliability of SOBQ.*** The reliability and test-retest correlation of self-efficacy, outcome expectation and perceived barrier reported by Heller et al. (2006) were .91, 79, .73; 0.52, 0.72, 0.55; and test-retest were .67, .78 and .71, respectively. In Pilot Study One, Pearson correlation coefficient between SOBQ and pedometer step counts were found to be statistically significant on self-efficacy with r=.44; and the Cronbach's alpha reliability has been used to test reliability of SOBQ, with good internal consistency of .81, .72, .70 on self-efficacy, outcome expectation and barrier to exercise, respectively. Whereas in Pilot Study Two, the convergent validity between SOBQ: self-efficacy, outcome expectation and barrier, and actical (mean minutes of PA in 7 days) and pedometer (mean step in 7 days) were found to be statistically significant. The correlation coefficient against actical with self-efficacy, outcome expectation and barrier were r=0.80, r=0.83, r=-0.90, respectively. While correlation coefficient against pedometer with self-efficacy, outcome expectation and barrier were r=0.71, r=0.76, r=-0.81, respectively.

Both validity and reliability in SOBQ were found to be highly correlated in the two pilot studies; SOBQ was reasonably valid and reliable as an outcome measure to be used for intellectual disabled population for the main study. Furthermore, the scale

was pilot tested by the present investigator with 20 participants and was retested after one month's time (reported in Pilot Study One), test-retest by intra-class reliability of SOBQ were .67, .78 and .71, respectively.

The measuring package for the present study contained the Self-Efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ) (see Appendix E). Participants completed the SOBQ with a face-to-face interview by the test administrator.

***Validity and reliability of PAR.*** Weston et al. (1997) in a validation study of PAR reported results from a study consisting of 119 junior and senior high school students. Results indicated that the same day test-retest correlation coefficient was substantial, r=.98. Additionally, validity of PAR was established through objective measure of physical activity derived from accelerometer and pedometer, Caltrac accelerometer, r=.77, pedometer, r=.88. The instrument was modified by Lum and Petosa in 2003 with concurrent validity established with 7-day diaries of PA r=0.72 and correlated with actigraph accelerometers r=0.83 for moderate activity (Hortz, 2005). In Pilot Study Two, concurrent validity for PAR (active workday) was tested with pedometer (mean step in 7 days) and actical (mean minutes of PA in 7 days) were also found to be very highly correlated ranging from r=.72 to r=.77; while the reliability for PAR tested with Cronbach's alpha reliability on daily routine activity, passive leisure activity and active leisure activity were .92, .78, .89, respectively. The results indicated that PAR adopted in the present study was valid and reliable. PAR (see Appendix F) was completed by the participants with a face-to-face interview by the test administrator.

**Procedures**

This study consisted of twelve weeks of intervention, starting from week zero

to week thirteen. Weeks zero and thirteen were set aside for pretest and posttest for both intervention and control groups, to whom sealed pedometers were delivered (Monday at week zero and week thirteen) and collected (Saturday at week zero and week thirteen) for five consecutive days, and to whom PAR-Q, PAR, and SOBQ were administered. The demographic data: height, weight and waist circumference were measured by the test administrator with a standard tape measure and Physician scale for the calculation of BMI (Inoue et al., 2000) in week zero and week thirteen. Throughout week 1 to 12, the intervention group had to attend a one-hour lesson per week. Detailed descriptions of curriculum contents were listed in the previous section of this chapter. In each lesson, participants of the intervention group were given a step diary for step goal assessments. In the initial phase of the course, knowledge of personal health and benefits of physical activity was delivered and goals were set. Then gradually as the course progressed, contents were focused on the three constructs, namely self-efficacy, outcome expectations and, barrier to exercise, were delivered to the participants of the intervention group through mastery experiences, observational learning, verbal persuasion, dealing with emotional state, group discussions, physical, social, self evaluations and goal setting. In each lesson the participants in the intervention group were checked for the steps taken each day according to their step diary so as to ensure that they reached 10,000 steps/day by week 12 (Croteau, 2004). The participants in the control group did not attend any lessons and worked as usual. However, participants of the intervention group were asked to wear a sealed pedometer every weekday throughout the study period. Pedometer data were recorded at the sheltered workshop by the test administrator. In addition, only participants of the intervention group were assessed on three psychosocial measures toward physical activity and physical activity data in the 4-month follow-up test. The reason of not including control group in the

4-month follow-up test was due to lack of staff and limited workers in a sheltered workshop. During the follow-up period, workers in sheltered workshop were very busy which led to the difficulty in recruiting both control and intervention group in the follow-up test.

## Assessment of Intervention Effects

The purpose of this study was to increase the psychosocial outcomes and moderate physical activity among adults with ID. Implementation evaluation was used to evaluate the degree to which the intervention had been delivered to the participants and the degree to which the participants had participated in the required assignments. Construct validity evaluation was used to examine if the theoretic constructs had been delivered adequately. A behavioral evaluation was also used to analyze the impacts of the intervention on the frequency of physical activity among the adults with ID in the intervention group.

### Implementation Evaluation

To deal with Type III errors, assessments on SCT-based educational treatment were exercised on the time spent within small group discussion, in-class writing, and class attendance. The implementation of the degree of teacher conducting the lessons and the degrees of teaching objectives being met were assessed. During the implementation of the intervention, a checklist of objectives was included for each lesson, and was filled by the present investigator. This assessment determined the degree to which the twelve-week components had been delivered as anticipated. This information provides insight into the curriculum that can prevent a type III error from being committed (Weston, Petosa, & Pate, 1997).

**Construct Validity of the Treatment Evaluation**

An SCT based treatment was assumed to impact physical and psychosocial aspects of the participants after the treatment had been determined when properly implemented. The construct validity of the treatment was then determined by the documentation of an intervention's impact on the theoretic constructs (Cook, Campbell, & Peracchio, 1979; Flay, 1986; Sussman, 2001). In Chapter Two, precise determinations were done for programme efficacy in bringing about desirable changes in theoretical constructs and behavioral outcomes (Flay, 1986; Hallam & Petosa, 2004; Sussman, 2001). The designed intervention in the present study was considered construct-valid as each and every of the constructs, namely self-efficacy, outcome expectations, and perceived barrier, was significantly changed by the intervention (See Table 1 for summary of the physical activity intervention using SCT).

**Data Analysis**

The independent variable was twelve-week intervention, and the four dependent variables included: psychosocial behaviour (self-efficacy, outcome expectation, barrier to exercise) and physical activity behaviour (moderate physical activity). MANCOVA analysis was computed to compare the effect of the intervention group to the control group, with group being the between-subjects factor (2 levels: intervention and control group), while controlling for the differences in pretest scores, age and BMI between the intervention group and the control group. If MANCOVA was statistically significant then it was appropriate to test the significance of the individual dependent variables using ANOVAs (Pallant, J., 2007). ANOVAs were conducted as a follow-up to the significant MANCOVA to determine where among these variables the differences existed. After a twelve-week intervention, the change in scores for the intervention group and control group was compared.

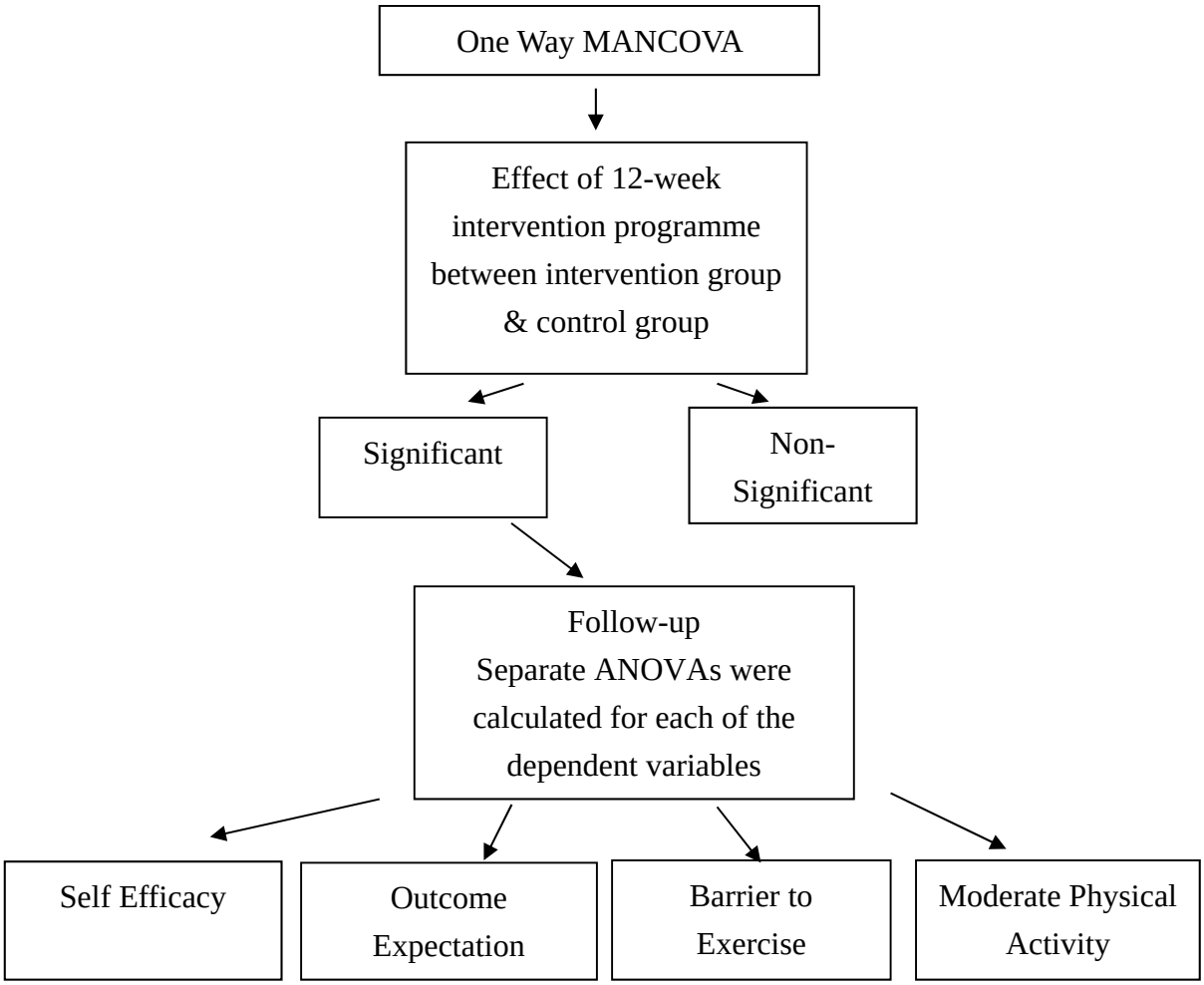


Figure 2. Primary Statistical Procedure for this Study

1. HA: The posttest scores would be statistically significant different between intervention group and control group while controlling for their scores on the pretest, age and BMI.
2. HA: The posttest scores on self-efficacy would be significantly higher in intervention group than in the control group.
3. HA: The posttest scores on outcome expectation would be significantly higher in intervention group than in the control group.
4. HA: The posttest scores on barrier to exercise would be significantly lower in intervention group than in the control group.
5. HA: The posttest scores on moderate physical activity would be significantly higher in intervention group than in the control group.

Bonferroni Criterion was used to control the 'family-wise' error for post-hoc multi-comparisons. The data collected in the present study were entered into the statistical software package SPSS (Version 20.0) file for data analysis and the significance level was set at .05. To determine the short-term effect of sustainability of the SCT-based physical activity intervention programme, a Paired Sample t-test was used to compare the mean scores of posttest and 4-month follow-up period of the intervention group only.

**Rationale of Using MANCOVA**

MANCOVA analysis was used to compare the effect of the intervention group to the control group.

**MANCOVA Analysis.** This design of statistics permits room for exploration if the score from group being the between-subjects factor (2 levels: intervention and

control group) were significantly different, which was an advantage to see the treatment effect of the group.

Multivariate analysis of covariance was adopted because it helped answer the different research questions concerning between-group differences across the dependent variables. An independent-sample-t-test was conducted to compare the four dependent variables (self-efficacy, outcome expectation, barrier to exercise and moderate physical activity) between male and female with alpha level set at 0.05/4 (Pallant, 2007) to control for 'family-wise' type I error.

It was found that there was no significant difference between genders in each of the dependent variables (See Table 15). Therefore, data analyses were conducted on all participants without gender differentiation. However, there were significant t-test differences in mean pretest scores between intervention and control group of self-efficacy and outcome expectation, the decision was to input pretest score as a covariate for analysis (See Table 15). On the other hand, correlation previous analyses by scatterplot of intervention and control groups with waist circumference, age, BMI were not appeared to have clear linear relationships. However, in order to examine the effect of the intervention without confounded by or mixed up with the effects of age, BMI, these potential confounders were partial out from the analysis. Therefore, MANCOVA was used to address between-subject differences in the dependent variables between the intervention group and the control group in the posttest scores while controlling for pretest scores, age and BMI on the dependent variables.

Besides, the present study also employed MANCOVA to compare the scores between intervention group and control group, according to Howitt and Cramer (2008), variables needed to be score variables in using MANCOVA.

The dependent variables needed to be conceptually related to the hypothesis and each other (Howitt and Cramer, 2008). In the present study, four dependent variables

of self-efficacy, outcome expectation, barrier to exercise and MPA were found to be correlated and therefore they could form a ‘set’ in MANCOA analysis. As there were four variables and there were four outcome variables tested, to compare four dependent variables together, a more robust way to control the cumulative type I error would be to use multivariate analysis of covariance.

CHAPTER 4

RESULT

## Introduction

The main purposes were to evaluate the effectiveness of the twelve-week intervention with regard to psychosocial behaviour using SCT and physical activity behaviour among adults with intellectual disabilities. MANCOVA analysis and paired samples of tests were conducted for this study. The dependent variables were self-efficacy, outcome expectation, and exercise barrier in psychosocial behaviour and the amount of moderate physical activity in daily physical activity behaviour. The following sections provided a description of the 1) characteristics of the participants' population, 2) statistical findings according to the research hypotheses, assumption checking and summary.

## Participants

A total of 80 participants from St. James settlements aged over 18 years were recruited to participate in the present study. Data were collected from February to June of 2011. Participants were randomly divided into an intervention group (n=40) and a control group (n=40). In the control group, ten participants did not complete the posttest due to health problem; while in the intervention group, six participants engaged into other activities, four dropped out due to health problem and one participant did not have 80% attendance rate in the 12-week intervention programme. After handling the missing data, 59 (30 males, 29 females) cases with completed data (intervention group, n=29 and control group, n=30) were analysed. The final data set contained participants with age ranged from 21 to 67 (Mean=35.83, SD=10.28), and BMI ranged from 13 to 64 (Mean=27, SD=7.33). The mean baseline value on moderate physical activity of participants was 1.49 (SD=1.83) indicating 1.5 days out

of 5 days engaging in at least one bout of 30 minutes of moderate physical activity in a day. The results showed that the sample subjects were mostly sedentary.

Participants were randomly divided into an intervention group and a control group. In the control group (n=30, male=17, female=13), descriptive statistics of participants were: age ranged from 21 to 67 (Mean = 35.16, SD=10.72), BMI ranged from 13 to 64 (Mean=27.50, SD=8.43). In the intervention group (n=29 male=13, female=16), age ranged from 22 to 58 (Mean=36.52, SD=9.94), BMI ranged from 18 to 43 (26.48, SD=6.10) (See Table 14).

Table 14.
Summary of Demographic Information of the Participants (N=59) (Mean, SD)

| Variable | Intervention Group: | | | | | | Control Group: | | | | | | Total: | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | All | | Male | | Female | | All | | | |
| | n=13 | | n=16 | | N=29 | | n=17 | | n=13 | | n=30 | | n=59 | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Age | 33.46 | 11.11 | 39.00 | 8.43 | 36.52 | 9.94 | 31.78 | 7.69 | 40.62 | 11.94 | 35.16 | 10.72 | 35.83 | 10.28 |
| Height (m) | 1.64 | 0.08 | 1.54 | 0.08 | 1.58 | 0.09 | 1.60 | 0.10 | 1.49 | 0.10 | 1.55 | 0.11 | 1.57 | 0.10 |
| Weight (kg) | 72.48 | 19.66 | 61.46 | 14.10 | 66.40 | 17.42 | 67.66 | 19.72 | 64.70 | 22.04 | 66.43 | 20.44 | 66.42 | 18.85 |
| BMI (kg/m$^2$) | 26.99 | 6.72 | 26.07 | 5.67 | 26.48 | 6.10 | 26.20 | 5.74 | 29.42 | 11.16 | 27.50 | 8.43 | 27 | 7.33 |
| Waist Circumference (inches) | 37.19 | 4.94 | 34.94 | 4.34 | 35.94 | 4.67 | 36.53 | 6.40 | 35.00 | 5.28 | 35.81 | 5.88 | 35.88 | 5.28 |

Note: No significant difference in the anthropometric measures between intervention and control groups by gender for all variables at the 0.05 level of significance.

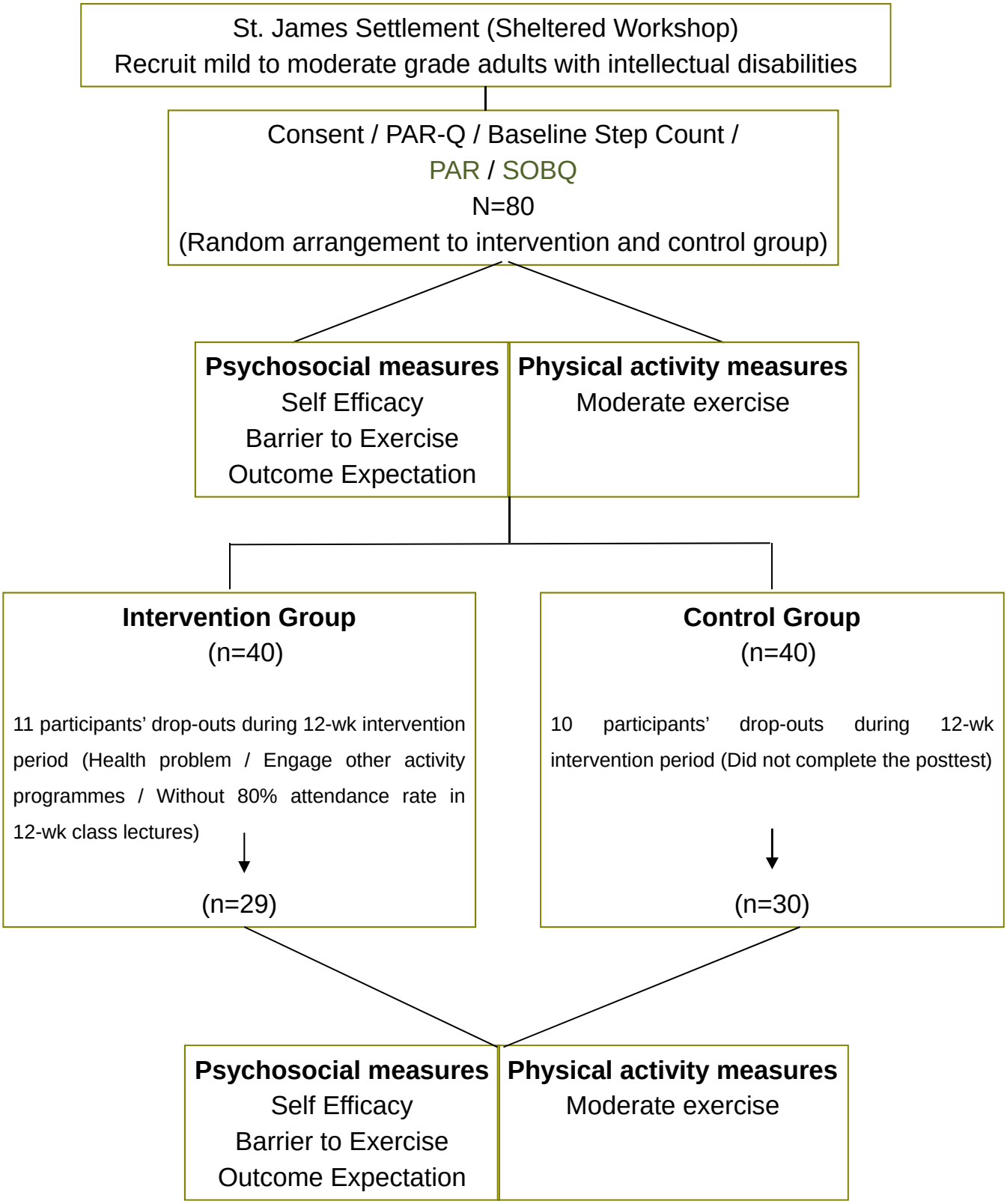


Figure 3. Design of current study

Table 15.

Mean Pretest Scores of Four Dependent Variables between Males and Females and between Intervention Group and Control Group

| Variable | Male | | Female | | Intervention Group | | Control Group | |
|---|---|---|---|---|---|---|---|---|
| | n=30 | | n=29 | | n=29 | | n=30 | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Self-efficacy | 8.50 | 2.52 | 8.79 | 2.75 | 9.68* | 2.87 | 7.63 | 1.90 |
| Outcome expectation | 19.73 | 4.86 | 20.68 | 5.19 | 22.13* | 4.55 | 18.33 | 4.77 |
| Barrier to exercise | 16.13 | 3.41 | 15.44 | 4.22 | 15.79 | 4.16 | 15.80 | 3.51 |
| Moderate PA | 0.10 | 0.30 | 0.69 | 0.25 | 0.60 | 0.25 | 0.10 | 0.30 |

Note:
No significant difference between male and female at 0.05 level of significance for all dependent variables.

*Mean pretest score of intervention group was significantly greater than the mean pretest score of the control group ($p<0.05$).

**Parametric Statistical Tests Assumptions**

According to Howitt (2008), MANCOVA was used when there were three or more different dependent variables at the same time and these variables should be conceptually related to the hypothesis and each other. They need to be numerical scores rather than categorical variables. In the present study, four dependent variables were correlated with correlation coefficient $r=-.53$, $p<0.01$ between outcome expectation and barrier to exercise; $r=.93$, $p<0.01$ between outcome expectation and self-efficacy; $r=.59$, $p<0.01$ between outcome expectation and MPA; $r=-.51$, $p<0.01$ between barrier to exercise and self-efficacy; $r=-.38$, $p<0.01$ between barrier to exercise and MPA, and $r=.62$, $p<0.01$ between self-efficacy and MPA. On the other hand, psychosocial data from SOBQ and physical activity data from PAR appear to be sufficiently normally distributed on self-efficacy (skewness = 0.1, kurtosis = 1.2), outcome expectation (skewness = 0.4, kurtosis = 1.3), barrier to exercise (skewness =

1.1, kurtosis = 1.2), and MPA (skewness = 0.5, kurtosis = 1.6) (Kline, 2005). MANCOVA was used in the present study, preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, homogeneity of variance, homogeneity of regression slopes, multicollinearity and homoscedasticity and equality of covariances. From the data, only one outlier was found in control group. Since there was no change in results after the deletion, the analysis in present study would base on the original data. For large samples (N=59), the t-tests and F-tests that follow were robust against the violation (Kappel, 1982; Pallant, 2007).

**One Way MANCOVA Result: Between-Subject Design**

MANCOVA showed a statistically significant difference between two groups (intervention group and control group) $F(4, 48)=32.8$, $P<0.001$; Wilk's Lambda=0.27, partial eta squared =0.73. Because the omnibus F level was significant; ANOVAs were conducted for each of the 4 dependent variables to determine where among these variables the differences existed.

Results of the follow-up (ANOVA) measure on MANCOVA showed that 12-wk intervention between-subjects were significant for all 4 dependent variables: self-efficacy: $F(1,116)=47.12$, $p<0.0125$, partial eta squared=0.48; outcome expectation: $F(1,134)=22.27$, $p<0.0125$, partial eta squared=0.30; barrier to exercise: $F(1,100)=10.50$, $p<0.0125$, partial eta squared=0.17; moderate physical activity $F(1,114)=96.79$, $p<0.0125$, partial eta squared=0.65 with a Bonferroni adjusted alpha level of 0.0125 (See Table 16).

Table 16.
Analysis of Covariance of the Mean Posttest Scores between Intervention Group and Control Group

| Variables | Intervention Group | | Control Group | | F | Sig.(2-tailed) | Partial Eta Squared |
|---|---|---|---|---|---|---|---|
| | Mean | Std. Error | Mean | Std. Error | | | |
| Self-Efficacy | 11.54 | 0.32 | 8.18 | 0.32 | 47.12 | .000* | .48 |
| Outcome Expectation | 24.62 | 0.50 | 21.00 | 0.49 | 22.27 | .000* | .30 |
| Barrier to Exercise | 11.60 | 0.64 | 14.72 | 0.62 | 10.50 | .002* | .17 |
| Moderate PA | 3.19 | 0.22 | 0.15 | 0.22 | 96.79 | .000* | .65 |

Note*: Significant difference between intervention group and control group at 0.0125 level of significance for all dependent variables.

**Summary**

The MANCOVA showed that the outcome of the 12-week intervention programme significantly influenced the posttest score of self-efficacy, outcome expectation, barrier to exercise, moderate physical activity, while controlling the effect for prestest scores, age and BMI. All posttest scores were significantly higher for intervention group than control group in self-efficacy ($p<0.01$), outcome expectation ($p<0.01$), moderate physical activity ($p<0.01$), and lower in barrier to exercise ($p<0.01$).

**Follow-up Test (4 months)**

The sustainability of the SCT-based physical activity intervention programme after months of posttest was tested. A paired sample t- test was used to compare the mean scores of posttest and 4-month follow-up test of intervention participants in the following dependent variables: self-efficacy, outcome expectation, exercise barrier and the amount of moderate physical activity. Results were as follows:

**Self-efficacy.** There was a statistically significant decrease in self-efficacy score

from posttest (M=11.89, SD=1.67) to follow-up test (M=8.68, SD=1.96), t=(28) =-7.36, p<0.01. The mean decrease in self-efficacy scores was -3.21 with 95% confidence interval ranging from -4.14 to -2.33. The eta squared statistic (0.66) indicated a large effect size (Cohen, 1988) (See Table 17).

**Outcome expectation.** There was a statistically significant decrease in outcome expectation score from posttest (M=25.06, SD=1.62) to follow-up test (M=23.68, SD=1.89), t=(28) =-3.57, p<0.01. The mean decrease in outcome expectation score was -1.38 with 95% confidence interval ranging from -2.17 to -0.59. The eta squared statistic (0.31) indicated a large effect size (Cohen, 1988) (See Table 17).

**Barrier to exercise.** There was a statistically significant decrease in exercise barrier score from posttest (M=11.31, SD=3.10) to follow-up test (M=10.10, SD=2.80), t=(28) =-2.12, p<0.05. The mean decrease in exercise barrier score was -1.21 with 95% confidence interval ranging from -2.37 to -0.04. The eta squared statistic (0.14) indicated a large effect size (Cohen, 1988) (See Table 17).

**Moderate physical activity.** There was no statistically significant difference in moderate physical activity score from posttest (M=2.96, SD=1.56) to follow-up test (M=3.17, SD=1.71), t=(28) =0.44, p>0.05. The mean increase in moderate physical activity score was 0.21 with 95% confidence interval ranging from -1.16 to 0.75.

Table 17.

Paired Sample t-test for Mean Scores between Posttest and Four-month Follow-up Test of the Intervention Group

| Variable | Posttest n=29 | | Follow-up Test n=29 | | Paired Sample t-test | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | df | t | Sig.(2-tailed) | Eta Squared |
| Self-efficacy | 11.89 | 1.67 | 8.68 | 1.96 | 28 | -7.36 | 0.01* | .66 |
| Outcome expectation | 25.06 | 1.62 | 23.68 | 1.89 | 28 | -3.57 | 0.01* | .31 |
| Barrier to exercise | 11.31 | 3.10 | 10.10 | 2.80 | 28 | -2.12 | 0.05* | .14 |
| Moderate PA | 2.96 | 1.56 | 3.17 | 1.71 | 28 | 0.44 | 0.66 | - |

Note*: Significant difference between posttest and follow-up test at $p \leqq 0.05$.

Table 18.

Percentages of Participants Reporting Rates of Moderate Physical Activity by Group at Pretest and Posttest

| Group | Day per week | Number of participants | Percentage | Number of participants | Percentage |
|---|---|---|---|---|---|
| Time | | Pre Test | | Post Test | |
| Intervention | 0 | 27 | 93.10 | 5 | 17.24 |
| Group | 1 | 2 | 6.90 | 1 | 3.45 |
| | 2 | 0 | 0.00 | 2 | 6.90 |
| | 3 | 0 | 0.00 | 3 | 10.34 |
| | 4 | 0 | 0.00 | 18 | 62.07 |
| | 5 | 0 | 0.00 | 0 | 0.00 |
| Control | 0 | 27 | 90.00 | 28 | 93.33 |
| Group | 1 | 3 | 10.00 | 2 | 6.67 |
| | 2 | 0 | 0.00 | 0 | 0.00 |
| | 3 | 0 | 0.00 | 0 | 0.00 |
| | 4 | 0 | 0.00 | 0 | 0.00 |
| | 5 | 0 | 0.00 | 0 | 0.00 |

**Intervention Fidelity**

An assessment sheet was completed by the present investigator during the twelve

one-hour classes to ensure that the SCT-based physical activity intervention programme contents had been implemented properly by the test administrator. With seventy-three teaching objectives, 100% were taught in the twelve one-hour lessons within the intervention group.

Besides, only those who had attended eighty per cent of the lessons and had completed the pretest and posttest were examined in the final analysis. Participant achievements of these learning objectives were included in the final sample when each in-class assignment and homework was returned to the test administrator. Attendance rate of 80% of all classes was achieved by the twenty-nine participants in the intervention group.

# CHAPTER 5

# DISCUSSION AND CONCLUSIONS

The promotion of physical activity among people with ID was important to help lower the risks of chronic diseases and overweight and obesity related diseases in this special population (U.S. Department of Health and Human Services, 2000). The prevalence of obesity among adults with disabilities tends to be more severe than the able-people. Most chronic health problems related to adults with ID were high blood pressure, osteoarthritis, and heart disease, which physical exercise can help alleviate (Centers for Disease Control, 2008). In Hong Kong, half of the special population were regarded as overweight (BMI >23), and about 29% obese (BMI >25) (Hong Kong Special Administrative Region Government, 2008). Most of the adults with ID were working in sheltered workshop; the data signified the importance of promoting a physical activity programme among adults with ID working there to enhance their physical activity participation. It was because in sheltered workshop, the job nature were usually sitting job that increased sedentary behaviours among workers with ID and increased their levels of physical inactivity, increased obesity and reduced levels of PA, which might be harmful to health in long term with increased risk of obesity and health related disease (Bartlo & Klein, 2011). In the present study, an effective physical activity intervention programme was conducted in sheltered workshop, which might help reduce the sedentary lifestyle among working adults with ID.

The purposes of the present physical activity intervention programme was to evaluate the effectiveness of a twelve-week intervention with regard to psychosocial behaviour using SCT and physical activity behaviour among adults with intellectual disabilities, MANCOVA analysis and paired sample t-tests were conducted for this study. The following sections included discussions and conclusions about the impact of the SCT-based educational treatment on: (1) psychosocial behavior, (2) physical

activity behaviour of adults with ID, (3) Implications of the results in Social Cognitive Theory, (4) pertinent data such as recruitment and retention, (5) strength and significance of the study (6) the limitations, and (7) recommendations for future research.

## Psychosocial Behaviour

### Intervention Effects on Psychosocial Variables

The twelve-week SCT-based educational treatment consisted of 720 minutes of lecture with in-class group discussion and home assignments. There were approximately 540 minutes on tackling exercise barriers activities, finding ways to exercise, self monitoring activities, goal setting activities, seeking other ways on exercise opportunity based on participants' ability, and achieving goals activities. This 12-week intervention was based on the Social Cognitive Theory (SCT) (Abdullah et al., 2004; Bandura, 1986; Bazzano et al. 2009; Heller, Marks, & Sisirak, 2006; Pastorfield, 2005; Peterson et al. 2008). The intervention group lessons were designed to target three constructs: self-efficacy, outcome expectation, and perceived barriers.

From the results of MANCOVA (Wilks' Lambda), comparing the psychosocial variables of self-efficacy, outcome expectation, barrier of exercise for intervention group and control group, revealed a significant influence for intervention group, while controlling the effect for prestest scores, age and BMI. Univariate tests (ANOVAs) results showed a significant improvement in all psychosocial variables for intervention group. ANOVAs results revealed that the twelve-week SCT-based educational treatment had a large effect size for increasing self-efficacy ( $\eta_p^2$=.48), outcome expectation ( $\eta_p^2$=.30) and barrier to exercise ( $\eta_p^2$=.17).

Findings were in line with interventions conducted in previous studies (HHPRP, PLPA, HLCP, HA, HL) that intervention programmes were effective in instigating

significant improvements in self-efficacy. Furthermore, the intervention program was showed to be applicable to Chinese population in Hong Kong among adults with ID in sheltered workshop. This construct was essential in SCT which can help people to engage in physical activity and strengthen their belief in resisting negative feelings. Four out of five interventions in previous studies being reviewed (HHPRP, PLPA, HLCP and HA) in chapter two, that outcome expectation was primarily targeted for participants developed to achieve intervention goal. SCT-based educational treatment affects participants' expectations and values on physical activity. For barrier to exercise, four out of five interventions in previous studies reviewed (HHPRP, PLPA, HLCP and HA) in chapter two that demonstrated a decrease in barrier to exercise immediately after intervention. Although barrier to physical activity was minimized after the intervention, the results showed that participants with ID received the greatest impact of self-efficacy and outcome expectation after the SCT-based educational treatment.

In fact, all intervention reviews in chapter two showed that there was a pronounced relationship between physical activity and the three constructs. Within these three constructs (self-efficacy, outcome expectation and barrier to exercise) self-efficacy stands out. Reviews showed that self-efficacy was significantly related to physical activity behaviour and many studies of interventions of the theoretic construct most widely targeted self-efficacy. Studies clearly demonstrated the importance of self-efficacy in physical activity among adults with ID (Abdullah et al., 2004; Bazzano et al., 2009; Pastorfield, 2005; Heller et al., 2006; McAuley, 1993; Sallis et al., 1992). This reaffirmed the need of self-efficacy as construct in altering the physical activity behaviour in intervention programme and was applicable to Hong Kong adults with ID.

**Follow-up Assessment.** A follow-up test after four months had been conducted

to determine the sustainability of the SCT based physical activity intervention program acting upon the intervention participants' self-efficacy, outcome expectation, and exercise barrier. It was noteworthy that all three psychosocial variables had a significant decrease ($p<0.05$) with large effect size on self-efficacy, outcome expectation and exercise barrier of 0.66, 0.31, and 0.14, respectively. Results showed that the twelve-week SCT-based intervention on physical activity was not sustainable with respect to its psychosocial influences on self-efficacy, outcome expectation after four months of posttest intervention; while participants faced less barrier when participating in physical activity and was sustainable after four months of posttest intervention.

**Conclusion on Psychosocial Behaviour of the Participants**

The twelve week SCT-based educational treatment showed a significant effect on the targeted constructs: self-efficacy, outcome expectation, and barrier to exercise. The results were consistent with other studies found in the literature that all five interventions (HHPRP, PLPA, HLCP, HA and HL) included self-efficacy demonstrated effective impact on strengthen participants' belief in resisting negative feelings in physical activity. Results from HHPRP (Heller, Marks & Sisirak, 2006) demonstrated that the variable of self-efficacy was significant ($p<0.001$). Result of the present study indicated that participants in the intervention group had increased in self-efficacy when compared to the participants in the control group. Bandura (1998) emphasized self-efficacy was fundamental leading to a new behaviour. Results in the present study showed that SCT-based programme was effective to increase self-efficacy of working adults with ID.

A significant result was found in outcome expectation after the SCT-based PA intervention programme, with an increase in the intervention group as compared to the

control group. This result was consistent with other studies found in the literature with four of the five interventions that included outcome expectation. In the present study, outcome expectation were targeted through step goals, handbook, assignment and small group discussion and it was found that there was a positive increase in intervention group. In fact, Bandura (1986) claimed that outcome expectation was a powerful drive of certain targeted behaviour, and that was important to have the construct, outcome expectation, to increase participants' physical activity behaviour in the present study. Both self-efficacy and outcome expectation were improved immediately in posttest after the twelve-week intervention.

Another significant result was found in the barrier to exercise variable, with a reduction in the intervention group as compared to the control group. Barriers to exercise is the core of many theories of health behaviour, and the result in the present study was consistent with other studies found in the literature with four of the five interventions that also included barrier to exercise. In HA (Pastorfield, 2005), significant result ($p<0.05$) was demonstrated among the special population in reducing barriers and enhancing physical activity.

In the present study, the three psychosocial constructs: self-efficacy, outcome expectation increased and barrier to exercise decreased significantly among adults with ID in intervention group, who completed a twelve-week SCT-based educational treatment with the effect shown immediately in posttest after the treatment ($p<0.001$), yet they were not sustainable at four months follow-up with significant decrease in self-efficacy and outcome expectation ($p<0.05$), except barrier to exercise with significant decrease ($p<0.05$). Comparing the effect size with self-efficacy (0.48) and outcome expectation (0.30), although barrier to exercise had a relatively small effect size (0.17), the follow-up test results were consistent as compared to previous studies (HHPRP, PLPA, HLCP, HA and HL). Similar to the present result, HHPRP (Heller,

Marks & Sisirak, 2006) demonstrated a decrease in barriers to exercise at six months ($p<0.05$) which sustained a period of time in the follow-up test, further study should explore the reason behind.

## Physical Activity Behaviour

### Intervention Effects on Physical Activity Levels

**Moderate Physical Activity.** Measures of moderate physical activity were required to recall the relative intensity, frequency, duration, and mode of activity for previous day using the PAR from Monday to Friday consecutively for a week. Participants were recorded as having moderate physical activity if it was volitional non-working time physical activity and was not an organized sport. After adjusting for pretest scores, MANCOVA results showed that the participants in posttest intervention group had higher number of days of engaging in moderate physical activity than that in the control group, $F(1,114)=96.79$, $p<.0125$ with the partial eta squared=.65 which indicated a large effect size.

In fact, the present study revealed that adults with ID did not meet the recommended guideline (CDC, 2008) on moderate physical activity. The distribution of the days of moderate physical activity of intervention group and control group were shown in table 18. Data showed that both intervention and control groups had low rates of moderate physical activity in pretest with 0 day a week of moderate physical activity (intervention group-93%, control group-90%) and 1 day a week of moderate physical activity (intervention group-6.9%, control group-10%). However, there appeared to be changes in moderate physical activity of the intervention group from pretest to posttest. At posttest, the number of days on moderate physical activity had increased. Participation of 0 day a week of moderate physical activity in the intervention group dropped from 93.10% (pretest) to 17.24% (posttest); whereas

participation of 4 days per week increased from 0% (pretest) to 62.07% (posttest). In the control group, there was a slight increase in 0 day and slight decrease in 1 day a week of moderate physical activity, with 90% (pretest) to 93.33% (posttest) and 10% (pretest) to 6.67% (posttest) respectively. Neither intervention group nor control group had five days a week of moderate physical activity (See Table 18).

From the result in chapter four, the mean days of moderate physical activity in intervention group was 0.07 (SD=0.26) in the pretest, and in the control group was 0.10 (SD=0.30) in the pretest. The mean days of moderate physical activity in the posttest was 2.97 (SD=1.57) in the intervention group and 0.07 (SD=0.26) in the control group. Data showed an increase in the intervention group in moderate physical activity by 2.9 days, and a decrease of 0.03 days in the control group. Although the moderate physical activity participation rate did not meet the recommended guideline (CDC, 2008), results showed that the percentage for 0 day moderate physical activity of participants in the intervention group had decreased from the pretest to the posttest by 75.86%; while the control group had increased by 3.33% (See Table 18).

MANCOVA analysis revealed that the twelve-week SCT-based educational treatment had a large effect size for increasing moderate physical activity. This result was consistent with Health and Health Promotion Research Project (HHPRP) (Heller, Marks, & Sisirak, 2006), which showed that participants with ID had significantly more exercise behaviour at posttest than did the control treatment, with exercise increased by 14% immediately after the intervention. In the present study, 93% of participants in the intervention group and 90% in the control group were sedentary with zero days of physical activity in leisure time; however, the results above indicated that, compared to the control group, sedentary participants in intervention group started moderate physical activity in their leisure time at the posttest assessment.

Besides, it also showed that those participants with sedentary behaviour tended to

do more moderate physical activity as their target activities. As in the posttest, the number of days of moderate physical activity had increased in the intervention group. 0 day a week of moderate physical activity dropped by 17.24% and 1 day a week of moderate physical activity by 3.45% whereas 2 days per week of moderate physical activity increased by 6.9%, 3 days per week by 10.34% and 4 days per week by 62.27%.

**Follow-up Assessment.** A follow-up test after 4 months had been done to determine the sustainability of the SCT based physical activity intervention program on amount of moderate physical activity in participants of the intervention group. In physical activity level, there was no statistically significant difference in moderate physical activity from posttest (M=2.96, SD=1.56) to follow-up test (M=3.17, SD=1.71), $t=(28) =-0.44$, $p>0.05$. Although the result on moderate physical activity score was not significant, the mean days of moderate physical activity had slightly increased from 2.96 to 3.17, which showed that the participants in the intervention group had maintained moderate physical activity in their own leisure time, which had become part of the routine in their daily activity. Another explanation may be due to the sources or handout in each lesson, that reminded participants to participate in physical activity in their own leisure time.

**Conclusion on Physical Activity Behaviour of the Participants**

In the pretest, the results of this study had shown that adults with ID in both intervention group and control group had low participation in moderate activities. All participants in both groups had less than 5 days of moderate physical activity physical activity in a week being recommended by The Centre for Disease Control and Prevention (CDC, 2008). Besides, physical activity behaviour was also low in both

groups in the posttest as well; however, there appeared to be significant changes ($p<0.0125$) in physical activity from pretest to posttest. In the posttest, although the intervention group had not meet the recommended 5 days of (0% participants) moderate physical activity guidelines, the percentage of participants had increased in two days (6.90%), three days (10.34%) and four days (62.07%) of moderate physical activity; while in the control group, 93.33% in zero day and 6.67% in one day of moderate physical activity in the posttest. The intervention group had a large reduction in the number of sedentary participants; while in the control group, there was a small increase in the number of sedentary participants. Both the intervention group and the control group did not meet the recommended guideline of physical activity (CDC, 2008), the data appeared to be in conflict with the U.S. data that 42% to 47% of adults with metal retardation participated in moderate to vigorous leisure time physical activity five or more times per week (Draheim, Williams, & McCubbin, 2002).

The physical activity behaviour in this study was in line with another local study that 44% of participants with disability did not participate in any physical activity and 56% only engaged in 3.8 hours per month in home exercise or less than 0.5 hours per month in other activities (Fu, 1986). Data found in this study indicated that 100% of participants did not meet the recommended 5 days of moderate physical activity guidelines. The result may be due to the limitation of this study that physical activity at work or organized sports were not counted. Due to the difficulties on data collection, this study considered the leisure time activity in weekdays only; therefore, weekend leisure time activity was not counted. If the days of the leisure time activity in weekends were to be added to the days of physical activity, the rates would match more closely with the national data in the USA that 47% of adults with ID participated in MPA to VPA five or more times per week (Draheim, Williams, & McCubbin,

2002).

Another reason for this discrepancy in physical activity participation rate may be due to the use of physical activity measurement. There were numerous methods in assessing physical activity, as mentioned in chapter two. Some measures use generic broad meaning of activity, for example: “how often do you engage in activity?” Some use a seven-day recall, or algorithms and other use energy expenditure devices to measure physical activity. In the present study, in order to increase participants’ physical activity after work during their free hours, only activities that occurred in non-working hours were measured. By using PAR, physical activities of the previous day were reported. The difference in each measurement method may have an effect on the rates of physical activity. Other reasons for difference in physical activity participation rate for participants in this study may be due to the nature of the targeted workshop. Since the present intervention was limited to one Hong Kong worksite of training and the job nature for ID workers in St. James Settlement were usually sitting job, different sheltered workshops might have different job duties and sport facilities for physical activity, which might affect the rates of physical activity after work.

Another possible explanation was the cultural factors among the special population in the West and the East. Unlike those in the West, adults with mild to moderate grade ID in Hong Kong usually live at home and work in a workplace that caters specifically for individuals with special population, such as sheltered workshop. Since these individuals live in different living environment, adults with ID in Hong Kong may face many barriers when exercising in the community. For examples, difficult access to exercise facility, lack of user friendly equipment for ID, long distance between home and sports ground.

Furthermore, since most adults with mild to moderate grade ID in Hong Kong live at home, their lifestyle may be influenced by their family living style, such as diet

and physical activity habit, priorities with respect to health behaviours, scheduling physical activity, recreational screen time (TV and computer use), planning and shopping for meals, portioning food at meals; that different social, psychological, environmental, and cultural variables might influence physical activity (Bodde, 209).

## Implications of the results in Social Cognitive Theory

### Theoretical Implications

The foundation of Bandura's SCT was the reciprocal interactions between person, environment and behaviour. In present study, the twelve-week intervention using SCT showed a significant impact on both psychosocial behaviour and physical activity behaviour among adults with intellectual disabilities. Although many authors accepted the idea of SCT triadic reciprocality, it was difficult to have empirical validation (Glanz, Rimer, & Viswanath, 2008). Since the triadic factors were not a direct simultaneous interaction between factors, thus it took time to manifest the interaction and showed the triadic relationship. The present twelve-week intervention study showed a significant impact on behaviour, which implied twelve-weeks, was a satisfactory period of time to verify the behavioral change empirically. Pastorfield (2005) also suggested that programme duration needed to be twelve-weeks in order to produce the best outcomes.

Another issue underlined in SCT was social diffusion. SCT regards social diffusion of a new behavior which in terms of the psychological factors governing their acquisition and adoption and the social networks through spreading and support, and the underlying factor of social diffusion was the innovation and acquisition of behavior (Bandura, 1986). Bandura (1986) separated acquiring the knowledge of the innovation and the adoption of that innovation; because they were regulated by

different determinants (Bandura, 1998). Acquiring the knowledge of the innovation was mainly determinant of the process of sending information on innovation or behavior; while adoption of the innovation was driven by many psychosocial constructs and their relationship to the innovation itself. These constructs needed to be psychosocial in nature which would determine the person to put an innovation into practice. In regard to adoption of a behavior, once health education programme or intervention imparted, the psychosocial constructs would drive the adoption of the behavior. In present study, self-efficacy, outcome expectations and barrier to exercise were used as psychosocial constructs in the twelve-week intervention programme, and the results showed that the implemented intervention had a significant effect on the both psychosocial and physical behaviours and had large effect sizes. The correlation between SCT constructs and the MPA were statistically significant between pre-test and post-test, and also between intervention group and control group. The results were in line with the literature that SCT psychosocial constructs drive the adoption of both psychosocial and physical behaviour.

**Practical Implications**

Before the main study, pilot study one, pilot study two and review of literature were used as a basis to consolidate the foundation for the twelve-week intervention in main study. The twelve week SCT-based intervention programme impacted all three constructs, including self-efficacy, outcome expectations and barrier to exercise.

Self-efficacy demonstrated significant effects in the present study. Self-efficacy was strength through lessons about overcoming barriers to PA, behavioral mastery experiences and discussion groups. Bandura (1986) stated that mastery experience was the most powerful channel to affect self-efficacy. In the present study, self-efficacy was targeted through the participants in the intervention group; they

were invited to participate in the intervention programme by taking a sixty-minute class per week on each consecutive Saturday for twelve weeks. Self-efficacy was targeted through in-class lessons, activities and assignments. A sixty-minute class mastery activity experiences including discussion of exercise benefits and barriers, identified the feelings towards exercise, identified step goals, identified exercise barriers. After several weeks of goal setting, administrator helped participants to create new goals according to each participant's step records, discussion on meeting new goal, plans on overcoming potential barrier to exercises. In the present intervention, mastery experiences were the primary method on improving self-efficacy and it showed a significant change in intervention group.

Outcome expectations had a significant effect in the present study. Outcome expectations were delivered through lessons about goal setting, exercise perception, planning and self-evaluate. In SCT (Bandura, 1986), outcome expectations was the belief that a particular outcome would produce a specific outcome. In the present study, the primary method on improving outcome expectations was goal setting. Participants in intervention group were asked to record the step count and created new goal throughout the twelve-week intervention programme. A step goal of 10,000 steps/day by week 12 was designed, if participants had less than 8,000 daily steps at baseline, then 10% increase would be set over baseline every two weeks until 10000/d; if participants had 8000-10,000 daily step, then increase by 5% would be set every week until 10,000/d; if participants had baseline 10,000, then participants were told to maintain the present physical activity level. (Croteau, 2004; Stanish, 2005; Tudor-Locke & Bassett, 2004). Outcome expectations were reinforced through log book, planning and discussion throughout the twelve-week intervention class time.

Barrier to exercise demonstrated significant effects in the present study and was the only construct that can be maintained in follow-up test after four months of posttest intervention. Barrier was delivered through received incentives based upon achieving behavioural goals they set for themselves. In SCT (Bandura, 1986), barrier was about person's confidence in overcoming barriers to that behaviour. In the present study, administrator had discussion with participants on overcoming barriers to physical activity, achieving behavioural goal they set for themselves and asked participants to recall difficulty when participating in physical activity. Throughout the twelve-week intervention programme, physical activity goal, step diary, step goal monitor, verbal encouragement and reinforce discussion on elimination of exercise barriers were used. In the in-class discussion, participants showed initiative as they were familiar with each other. The participants in the workshop had known each other for many years, they developed mutual trust and understanding among themselves and showed support and care to each other. This might explain the significant effect in both intervention and follow-up tests.

The SCT construct showed a significant impacted on both psychosocial and physical activity behaviour in the present study; and was suitable and feasible in intervention targeted on population among adults with ID. Apart from constructs, the following would discuss SCT's triadic interaction between personal, environmental factors and behaviour (Bandura, 1986)

**Personal Factors**

In Healthy athletes, Pastorfield (2005) suggested that winning ribbons and medal, playing with others on the team, getting exercise were keys to motivate participants. External positive reinforcement was focused on Healthy athletes and was interpreted these results as a focus on mastery-oriented experiences. Pastorfield (2005)

claimed that person with ID winning ribbons and medal were represented a task and/or social incentive orientation. Instead of focusing on winning and success, coaches and athletes were emphasised on the accomplishment of goals, effort, improvement, recognition and social acceptance. Based on SCT, mastery experiences were used in the present study with sticker (extrinsic), goal setting, walking, verbal encouragement (intrinsic) throughout the twelve-week intervention programme, and showed a significant result. Hutzler and Korsensky (2010) stated that motivation was established using a combination of extrinsic motivation such as winning ribbons and medal, received a sticker, and on intrinsic motivation factors, such as having fun, being skilled, reached the set goal, and spending time with friends.

**Environmental Factors**

Based on the SCT (Bandura, 1986), social support appeared to be an important factor towards physical activity and sports. In PLPA, Peterson et al. (2008) showed that social support of the staff was directly related to older participants (r=0.35) and social support of peers was significantly correlated with self-efficacy (r=0.28); while in Healthy athletes, Pastorfield (2005) found that making new friends as well as social support from family and peers were acted as main contributors to motivation. Bartlo and Klein (2011) suggested that an easily accessible and familiar environment for individual with ID could enhance the sustainability of the development of physical activity programme. Present study was conducted in sheltered workshop which participants were familiar with the venue, staff, and peers. Besides, all participants' parents showed their support with the signed parent consent returned. Teaching experience, knowledge, style, and character were also acted as an important sources of environmental factors to enhance certain behaviour in ID in present study.

**Barriers to Participation**

In contrast to most studies that examined barrier to participate, present study did not receive any complain from participants about transportation as a barrier to exercise. In HHPRP (2006), results indicated that the key barriers to exercise for adults with ID were cost, being tired or bored by the exercise, and problems using equipment and about half of the individuals lacked confidence in their ability to perform exercises. Apart from using equipment or free weight in fitness room, the present study used walking as a process measure which was an easy mode of exercise with low cognitive training needs and being cost effective (Bartlo & Klein, 2011); besides, shuttle bus was provided by the St. James to transport their workers from their home to sheltered workshop. Although most of the studies in literatures (Hutzler and Korsensky, 2010) showed that transportation was a primary barrier for participation; during the group discussion, participants in the present study complained about the absence of park or leisure area to exercise besides their home instead. Further investigations were required to have better understanding between Hong Kong and Western sheltered workshop and the leisure service around the living environment.

Since Heller's HHPRP (2006) showed promise and improvement on health of people with ID, and a modified BIQ was adopted as the psychosocial instrument in present study. The present study adopted the same scale and items as Heller's HHPRP on self-efficacy, outcome expectation, except barrier to exercise. In HHPRP, there were 18 questions on barrier to exercise, after a preliminary review on the items, 9 items of the original battery were excluded because the contents were not suitable for participants with intellectual disabilities. The results were used to compare with the results from HHPRP (Heller, 2006) and each subscale total score on both data were

calculated by adding scores of items categorized by the subscale. In HHPRP (2006), all the outcome measures were as followings:

**Increase Self-efficacy.** Compare with the result in HHPRP (2006), both participants in the intervention group had a significant increase in self-efficacy ($p<.001$) after twelve-week intervention programme. In HHPRP (2006), participants in the intervention group (mean=13.5) reported improvement in self-efficacy to perform exercise in both immediately after training ($p<.001$) and at six months follow-up test ($p<.05$) when compared to the control group (mean=13); however, in present study, participant in intervention group had significant decrease at four months follow-up test ($P<.01$).

Although the result of intervention group after twelve-week intervention was similar in HHPRP (2006) and present study, there was a mean score difference between control group (mean=8.18) and intervention group (mean=11.54) in present study. In HHPRP (2006), the small mean difference between intervention group and control group could be explained by the diversified content and the sessions of the intervention programme. In the present study, the 12 one-hour lectures mainly focus on psychosocial aspect namely: self-efficacy, outcome expectation and barriers to exercise in twelve-week intervention programme. Participants in intervention group only concentrated on the three psychosocial aspects they learned from the classes which should be easier for the ID participants to handle. In HHPRP (2006), the curriculum includes various focuses in twelve-week intervention programme, such as energy fatigue, pain measure, life satisfaction, choice-making, exercise knowledge, perception, barrier, social, environmental support, self-efficacy, and community integration. Compared with one-hour lecture per week, participants had three 1-hour modules per week in HHPRP (2006). The intensity and the content of the curriculum in twelve-week intervention programme may be the reason to explain the mean score

difference among the ID participants.

**Increase Outcome Expectation.** Compare with the result in HHPRP (2006), the result was similar with the present study that participants in the intervention group had a significant increase in outcome expectation ($p<.001$), with similar mean score between control group (mean=22) and intervention group (mean=24) after twelve-week intervention programme; while in HHPRP (2006), participants in the intervention group (mean=24) reported improvement in outcome expectation to perform exercise in both immediately after training ($p<.001$) and at six months follow-up test ($p<.01$) when compared to the control group (mean=22). However, in present study, there were significant decrease of four months follow-up tests in both self-efficacy and outcome expectation. The differences between the sustainability of four month follow-up test and six months follow-up test could be explained by the design and intensity of the curriculum of the intervention programme. In the present study, only one-hour lectures were provided throughout twelve-week intervention programme which might result a significant positive effect immediately after training but not sustainable to four-month. On the other hands, HHPRP (2206) provided three 1-hour modules per week in morning, afternoon and early evening throughout twelve-week intervention programme. The design encourages participants to familiarize themselves with the contents of the curriculum which showed the sustainability to six month follow-up test.

**Decrease Barrier to Exercise.** Compare with the result in HHPRP (2006), the result was similar with the present study that participants in the intervention group had a significant decrease in barriers to exercise ($p<.001$), with mean score between control group (mean=14.72) and intervention group (mean=11.59) after twelve-week

intervention programme and was also significant decrease at four month ($p<.01$); while in HHPRP (2006), participants in the intervention group (mean=26) reported improvement in barriers to exercise in both immediately after training ($p<.001$) and at six months follow-up test ($p<.05$) when compared to the control group (mean=30). Barriers to exercise was the only construct that showed positive significant improvement and was sustainable in four months follow-up test in the present study. The reason of the participants face fewer barriers when participating PA and was sustainable after four months of posttest intervention might be explained by the activity of the curriculum and the setting of the sheltered workshop. During the twelve one-hour lectures, there were activities target on overcoming barrier exercise, such as setting step goal. Besides, the venue, staff, peers and setting of the sheltered workshop were familiar environment for participants which could enhance the sustainability of the intervention programme. With the absence of park or leisure area to exercise near their home, participants usually spent their time and exercise in the sheltered workshop, together with the step goal target for themselves and the familiar setting in sheltered workshop, participants could walk comfortably and freely in the sheltered workshop during and after the intervention programme.

**Mean Score.** Apart from the similar mean score of outcome expectation and barrier to exercise between HHPRP and present study, the present study result showed that the mean score of self-efficacy was quite low but was having a significant improvement. Both HHPRP and the present study had twelve-week intervention programme with mastery experience in intervention group. It was expected to have a significant different between intervention group and control group, since Bandura (1986) discussed about mastery experiences were the most powerful means to change self-efficacy. However, it was surprised to know about the low self-efficacy score in

control group (mean=8.18) among adults with ID in Hong Kong sheltered workshop when compare to the control group (mean=13) with HHPRP. One of the possibilities maybe due to the lack of confidence in their ability to perform exercises (Heller, 2006), which might be influenced by their family in terms of knowledge of exercise. Further investigations were required to have better understanding on participants' parent and the living style between Hong Kong and Western.

Based on the findings from the present study, there were some similarities between SCT intervention studies when compare with a typical population.

The results from the review (Rhodes, Fiala & Conner, 2009) of non-disabled adult populations between 1989 and 2009 showed that a large effect size relationship was found between physical activity and affective judgements, such as expectation, efficacies, pleasure, displeasure, affective attitude, enjoyment, and intrinsic motivation. Among 85 correlational studies, review showed that 83 studies had a significant positive correlation (r=.42) between affective judgements and physical activity. Same with the previous review in the present study, SCT appeared to be the most influencing for future behaviour changes, while self-efficacy was the most commonly operationalized construct.

From the review (Rhodes. et al., 2009), 20 experimental studies reported that there were positive changes in PA and also impact on affective judgements after intervention. Same with the present study, 12-week intervention programme had impact on self-efficacy, outcome expectation, barrier to exercise and PA. Behavioural-focused intervention (Rhodes. et al., 2009) such as walking, weight training, aerobic training, strength training, and outdoor exercise also showed a significant result in affective judgements of PA depending on baseline status. These

interventions also provided information on overcoming barrier and self-regulating PA skills into participant's lifestyle.

Another recent review study (Chase, 2013) on the past 12 years of PA intervention among adults in typical populations reported that cognitive-based intervention showed to be successful in increasing PA behaviour. Again, self-efficacy was the most commonly used construct and was the best operationalized among the studies in review. Apart from self-efficacy, outcome expectation was also common construct that have positive effect on intervention group. In terms of intervention characteristics, goal setting reported to be effective and successful in changing PA behaviour.

Findings from reviews showed that SCT model is foundation for PA promotion programme, it described and explained human behaviour in both typical and special population. When reviewing both typical and special population, studies showed that both population with or without disabilities may face the same barrier to PA, only the context was likely to be different due to unique factors associated with the conditions among ID (Messent, Cooke, & Long, 1999; Sutherland, Couch, & Iacono, 2002). And among affective judgements, self-efficacy and outcome expectation stand out to be the successful operational constructs among the review studies.

## Designed Treatment Delivery

Assessment on SCT-based educational treatment was to deal with type III errors (Sussman, 2001). In order to deal with the type III errors, the degree of teachers' involvement in executing the lessons and the degree of teaching objectives being met were assessed. The result suggested that the degree of teacher in executing the lessons and the degree of teaching objectives matched well with the expected lessons when 100% had reached agreement of all teaching objectives being taught in twelve

one-hour classes. Most of the participants were very much disciplined and obedient, only two participants had emotional problem in class when they were in group discussions. But after that conflict in the lesson, the test administrator and the present investigator identified them and decided to separate them for the rest of the lessons. All the participants helped with each other and were involved during the twelve-week SCT-based educational intervention, which allowed the test administrator to go through all the objectives adequately.

Heller (2006) suggested that the effectiveness of the intervention was based on the quality of the peer training, amount of the treatment delivered, and the quality of the delivery. She also suggested that the duration of twelve-week was suitable for the people with ID. In the present study, the test administrator had substantial knowledge of pedagogy and experience with ID population for over thirty years. The present investigator found that specialists or trained teachers were essential for the best outcome in educational treatment, especially with the participants that need special aids or attention. This was supported by Sallis et al. (1993) that withdrawal of specialists would significantly affect the quantity and quality of physical education. In conclusion, type III error was unlikely in this case.

The exposure of the participants to the intervention was also assessed so that the participants had adequate time to be exposed and to digest the lesson contents. Thus assessment was focused on class attendance. As presented in chapter four, only those participants with more than 80% of attendance were included. Participants involvement were excellent, although there were late-comers (not more than five minutes) in the earlier lessons, the test administrator alerted participants to be on time for lessons. To encourage the punctuality and involvement throughout the twelve-week SCT-based educational treatment, the test administrator made use of verbal persuasion and reward such as stickers for those participants who were punctual

or answered questions in each lesson.

**Summary of Designed Treatment**

The uniqueness of the present study was to evaluate the effectiveness of the treatment that rarely appeared in intervention literature. Type III errors refer to a situation in which certain outcomes occur when the implementation had not been carried out or executed adequately (Basch, Sliepcevich, Gold, Duncan, & Kolbe, 1985). The present study provided an implementation evaluation that assured the SCT-based educational treatment executed to a reasonable degree. The results showed that the delivery lessons matched with the designed lessons very well, in seventy-three teaching objectives, 100% were taught in the twelve lessons within the intervention group. Besides, all the participants had achieved at least 80% of attendance. Results showed that the learning objectives were completed with high fidelity and type III error was unlikely.

After assessing the implementation, construct validation of the treatment evaluation was needed to assess how a programme initiated modifications in health behaviour. In the twelve-week SCT-based educational treatment, three constructs: self-efficacy, outcome expectation, barrier to exercise were targeted. The evaluation showed that the twelve-week SCT-based educational treatment had large effect on all constructs in between-subject and within-subject, with large effect size on self-efficacy 0.48, 0.17; outcome expectation 0.30, 0.12; and barrier to exercise 0.17, 0.27 respectively.

The evaluation of the behavioural effect of twelve-week SCT-based educational treatment demonstrated change in moderate physical activity in leisure time. The results showed that there was a large effect size in intervention group on moderate physical activity with $F(1,114)=96.79$, $p=.0125$ with the partial eta squared=.65. which

indicated a large effect size. Although both participants in the intervention group and the control group did not have MPA five or more days a week (CDC, 2008), intervention group showed significant improvement ($p<0.0125$) on moderate physical activity with the mean days 0.07 (SD=0.26) at pretest, and mean days 2.97 (SD=1.57) at the posttest. Data in the intervention group showed an increase in moderate physical activity mean day by 2.9 days, the intervention group had a substantial reduction in the number of sedentary individuals with regard to moderate physical activity that increased by 72.42%. This result indicated that sedentary participants usually increase their leisure physical activity by moderate activity.

Although both intervention group and control group have a significant increase of MPA from pretest to posttest, both intervention and control groups did not meet the recommended 5 days of MPA guideline (CDC, 2008) in leisure time. The possible explanations for this finding maybe due to the nature of the study and leisure space in living area. This intervention aimed at increasing participants' leisure physical activity after work during their free hours, so organized physical activity was not counted and level of physical activity during working hours was not counted. Participants with ID needed more supervision on workout especially in their own leisure time, which appeared that they tended to face more barriers in doing physical activity on their own. Besides, practical concern of doing physical activity in leisure space, such as parks, with limited aids and assistance provided in parks of Hong Kong might pose barriers for them to work out safely in their leisure time.

Participants enjoyed the lessons during the twelve-week SCT-based educational treatment; they were punctual and showed involvement in classes. Pedometer and step goals were used in the process measure for the participants in intervention group and the goal was to build up to 10,000 steps/day by week 12 (Croteau, 2004; Stanish, 2005; Tudor-Locke & Bassett, 2004). Participants did put effort in increasing their

step goal and found that they were competing with their classmates in the later lessons. Encouragements and praises were used throughout the twelve-week lessons by giving stickers to those who achieved the step goal in that week. By week 12, 55% of participants showed improvement when comparing to week one; 6% of participants achieved 10,000 steps per day and 10% achieved 7,500-9,999 steps per day. Certificate was another encouragement that excited them in the last lesson. Participants were eager about the graduation day and each received an attendance certificate of the twelve-week educational class.

To conclude, the present study confirmed the application of the twelve-week SCT-based educational treatment that had positive impact on all psychosocial and physical activity variables (self-efficacy, outcome expectation, barrier to exercise and moderate physical activity) of intervention group and posttest for adults with mild to moderate ID, but was not sustainable to four months except barrier to exercise.

## Strength and Significance of the Study

In reviewing the literature pertaining to adults with ID intervention targeting physical activity behaviour and psychosocial behaviour, there were several new components or advices being added in the present study based on the reviews. The present study used randomized control group to enhance the validity and four-month follow-up test to measure a longer term adherence of intervention (Heller, McCubbin, Drum, & Peterson, 2011). Worksite was targeted in this study, because it was easy, accessible and familiar environment for adults with ID which could enhance the sustainability of the development of physical activity programme (Bartlo & Klein, 2011). Walking was used as a process measure, because walking is an easy mode of exercise with low cognitive training needs and being cost effective (Bartlo & Klein, 2011); and it was used a s setting goal for intervention participants and studies showed

that use of step goal can improve daily steps taken. Many of the interventions on health promotion programme among adults with ID have been demonstrated to have a positive impact on exercise adherence and maintenance. However, most of the intervention programmes were focused on physical fitness such as cardiovascular fitness, muscle strength, balance, or caretaker's rate of physical activity in day training or vocational rehabilitation center with little focus on behavioral changes toward physical activity among adults with ID in worksite. Bartlo and Klein (2011) suggested that research in intervention programme needed to be practical and adaptable to the need of individuals with ID. The uniqueness of the present intervention programme was implementation of SCT-based psychosocial behaviour towards physical activity among adults with ID with a focus on those working in a day training center in Hong Kong. SCT-based physical activity intervention programme showed impacted on both psychosocial (self-efficacy, outcome expectations and barrier to exercise) and physical activity (moderate physical activity during non-working time) behaviour. The present study had also successfully provided an effective and feasible twelve-week physical activity intervention programme at worksite environment for Hong Kong ID worker and follow-up test on maintaining short term adherence of the SCT-based physical activity intervention programme. This study also showed that the tailor-made one-hour lesson per week were effective on modifying both psychosocial and physical activity behaviour among adults with ID. Besides, the study supports the applicability of the process measure in which the pre-set goal for total daily steps to be taken and encourages participants to reach the recommended activity level on 10,000 steps/day.

The present SCT-based physical activity intervention programme is shown to be practical and adaptable to enhance both physical and psychosocial health, which reduced the sedentary lifestyle and helped individuals with ID to be physically active in their lifestyle together with the increase of self-efficacy, outcome expectation and

lessened barrier towards exercise.

## Limitations

There were difficulties in the recruitment of mild grade ID participants only, since there were limited workers in a sheltered workshop; both mild to moderate grades of ID participants were included. The IQ of mild grade and moderate grade participants were different which could lead to different patterns of physical activity participation especially during their own leisure time. Besides, the present investigator could not distinguish participants whether he/she had mild or moderate ID.

In the present study, sheltered workshop had the responsibility to secure the participants' personal information, and withhold all the health status, degree of illness and personal particulars and demographic data among participants. Therefore, confounding variables such as degree of illness which may influence the results in the present investigation might not have identified. Although severe grade participants were excluded in the present study, participants with mild to moderate grade might have different degrees of illnesses such as autisms, hyperactivity, high blood pressure, obesity, heart disease and visual problem. Multiple disabilities may also affect the rate of physical activity during their own leisure time.

Multiple disabilities might affect the drop out rate of the participants in the twelve-week intervention program, some of the participants needed to have medical check and stayed in hospital for a period of time, some needed to engage in other programmes from sheltered workshop occasionally, some did not participate in posttest and some did not have 80% attendance rate that led to high drop-outs rate with 21 cases of missing data.

Data collection was only possible during working hours and at working days. It was not possible to collect data on Sunday in the present study. Only leisure time

physical activity in weekdays were counted, which might have affected the results.

Although participants completed the questionnaires with a face-to-face interview by the test administrator, and the instruments used in this study were found to be valid and reliable; measurement could be another potential limitation. It was because during the face-to-face interview, participant's answers could be affected by those around them, which might have affected their concentration. On the other hand, results might be affected by the validity and reliability of the translated version (Chinese-language) SOBQ because of the translation which might have worded to ease understanding by the individuals with ID and which might have deviated from the original meanings of the English-version scale.

Another potential limitation was a personal factor that was the teaching style of the test administrator who delivered the treatment. The character, personality and teaching experience of the test administrator may have impact on participants' involvement in the intervention at greater or lesser degree. Other than personal factor, intervention venue was also important for participants with ID to have a comfortable and relaxing environment for learning in which participants were familiar with.

Living environment would be another possible limitation. Different living environmental support may affect the leisure time physical activity behaviours among participants with ID. Some participants lived near to the public park or estate with clubhouse, but some lived in busy congested area that was not close to a public park. Some had indoor sports ground nearby while some did not. Therefore, leisure time physical activity participation might be affected due to the accessibility on the recreation venue.

Lastly, a limitation of the study was that the four-month follow-up test after intervention was conducted only on participants of the intervention group because of lack of staff and limited workers in a sheltered workshop.

## Recommendations

Based on the application of the twelve-week SCT-based educational treatment implementation, the present study confirmed the hypotheses for the intervention programme having positive impact on psychosocial and physical activity variables (self-efficacy, outcome expectation, barrier to exercise and moderate physical activity) for adults with mild to moderate ID right after the intervention. Having provided an understanding of the participants in this special population, a better concern on delivering interventions was advised as follows for future studies.

Trust and positive atmosphere are important sources of enhancing certain behaviour in ID. The promotion of physical activity among participants in special group can focus on the development of positive feelings, such as enjoyment towards participation in physical activity. Treatment lessons should be delivered by a professional who has substantial knowledge and experience with people with ID and were responsible for participants' behaviour, which can easily develop trust among ID participants. Especially trained teachers may be needed for future intervention in order to enhance the participation effects.

Future study should recruit more participants in case of the high drop-out rate, in present study, there were 21 participants from intervention group drop-out due to health problem, engage other activity programmes, or without 80% attendance rate in 12-wk class lectures and there we 10 participants from control group drop-out due to incompletion of the posttest. Future study could have mid intervention check on participant in both intervention and control group so as to ensure the health conditions of participants; or a buddy system that allowed participants group in two or more to motivate one and other throughout intervention; instead of putting the attendance certificate in the last lesson, test administrator could distribute the attendance

certificate in every three to four weeks as an encouragement for the participates.

Future study should also focus on the varying degrees of ID participants. Intervention should focus on mild, moderate, or severe grade of ID separately. Different age groups should also be investigated separately in regard of physical activity rate. Future study should also look into the physical activity behaviour at seven consecutive days including weekend and also working hours. To eliminate type III error, only one sheltered workshop was recruited in the present study; however, future study could recruit participants from different sheltered workshops to investigate different job nature adherence on physical activity.

Venues of the treatment or interviews should be the place that participants were familiar with. Minimal distraction was desirable, especially for those who have ID. Activity monitor / devices such as Caltrac, Tri-trac, CSA, Actical can also be used to measure physical activity instead of one-day recall.

The follow-up test could be placed earlier, such as less than four months, to look at the adherence of the tested intervention. Control group should also be included in the follow-up test. In present study, there was lack of control in recruiting participant into control group in the follow-up test, future study should have an early check of the schedule with the sheltered workshop on manpower, in order to avoid the busy time with heavy work load at peak season that affected the recruitment of the study.

Since moderate physical activity has been improved in the twelve-week SCT-based educational treatment, vigorous physical activity would be the next step for future study. It was reasonable to target moderate physical activity as it could be more enjoyable than vigorous physical activity, future study should attempt to target more directly and specifically on vigorous physical activities in the intervention instead. Participants in the SCT-based intervention group had shown significant results in moderate physical activity, thus a larger scale of similar kind of study should

be considered in the future.

**APPENDIX A**

誠意邀請貴子女參加在職員工『自覺身心健康』課程

敬啓者

本人乃香港浸會大學體育系講師，多謝各位家長一直支持與合作爲智障人士提供健康生活水平，現在研究將進入最後階段，根據早前在聖雅各福群會收取的數據已編制了一項有助推行更有效的健康活動計劃服務給輕度，中度在職智障學員。其後再配合健康飲處方，使計劃更趨全面。這部份將由有聖雅各福群會社區營養服務及教育中心負責研究及編寫處方。關於健康活動練習會邀請國際康體專才培訓學院協助及教授。

健康活動計劃爲一項 12 星期，每星期一次的一小時課堂，目的是給在職弱智學員一些運動的知識，提昇個人心理質素以達到自覺做運動，目的爲令身心健康。本健康活動課堂亦參考了很多外國研究，發現效果十分理想，美國特奧亦有提供相關課堂以達至弱智人士健康的身心。 研究希望發展至本港工場爲在職智障學員提供一項自覺身心健康課程，現誠意邀請 貴子女參與本研究，完成後會頒發証書一張。

若你願意參與，我們會在 貴子女工作機構（聖雅各福群會）免費為你提供一項為期 12 星期「自覺身心健康課程」，同時會向學員派發一份有關活動量及對活動態度的問卷，並會進行一些步行測試。我們會派發一個數步器（型狀跟傳呼機相似）給學員，數步器佩戴在右邊腰身上連續 5 日，工作人員會為學員記錄放工後總步行數量，並在完成後貴子女除去數步器。內容如下：

家長只需在以下 2 種情況爲 貴子女除下腰帶（數步器），並在協助戴回完位（右邊腰間）

一）如遇到有機會弄濕數步器的情況時（例如：游泳，洗澡），家長需要爲 貴子女除下腰帶，並在乾身時協助佩戴回完位（右邊腰間）。

二）睡覺時，家長需爲 貴子女除下腰帶，並於第二天早上起床時協助佩戴回完位（右邊腰間）。

研究所得的個人資料只會作爲研究用途，而且絕對保密，經分析後將會全部銷毀。

是次研究計劃之成功全乃有你的支持與參與，如果閣下同意 貴子女參與這項研究，請填妥下列回條，以便 貴子女交回所屬機構。 另外，如 閣下對這次研究有任何查詢，歡迎至電 9644-1577 與本人陳雪瑩聯絡或香港浸會大學體育系周碧珠教授（電話： 3411 7007）。

此致

貴家長

陳雪瑩

香港浸會大學體育系

二零一一年一月六日

**回條請於一月十三日或之前交回所屬機構

******** ********** 參與研究同意書 回條 ********** ********

本人_____明白是次研究目的和內容，並 同意 / 不同意 *讓貴子女_____參與是次『自覺身心健康』課程。(* 請刪去不適用)

家長簽名: _____

日 期: _____

聯絡電話:_____

## APPENDIX B

**HONG KONG BAPTIST UNIVERSITY**
**OFFICE OF GRADUATE SCHOOL**
**Memorandum**

To: Chan Suet Ying, PE
From: Jo Kam, Secretary, HASC
Date: 29 December 2010

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**Research Protocal and Documentation for Research involving Human / Animal or Safety subjects**

I am pleased to inform you that the Committee on the Use of Human and Animal Subjects in Teaching and Research has considered and approved your research protocols for the use of human / animal or safety as attached. You may wish to keep this form as future reference.

Jo Kam

Encl.

## APPENDIX C

Contents for Lesson 1-12

| Lesson | Targets | In Class Exercises | Remarks |
|---|---|---|---|
| 0 | Pretest<br>Briefing Session | • Consent from parents and participants<br>• Pre-screening<br>• Fill out pre-test instruments | • Use pedometer to monitor days step / PA record<br>• PAR-Q<br>• Measure weight, height and waist circumference<br>• PDPAR-C<br>• BIQ-C |
| 1. Introduction to programme | Knowledge | • Discussion of physical activity<br>• Write about type of physical activity | • Use pedometer on step monitor |
| 2: Exercise benefits | Knowledge<br>Perceived Barrier | • Discussion on exercise benefits and barriers<br>• Writing feeling after exercise | • Identification of exercise barriers |
| 3. Exercise barriers | Knowledge<br>Perceived Barrier | • Exercise stage of change<br>• Identify things to do before exercise<br>• Discuss exercise barriers | • Step diary and step goal monitor |
| 4. Exercise opportunity | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Identify exercise opportunities in environment | • Set activity goal |
| 5. Self-monitoring | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Focus on self-monitoring with step goal<br>• Create new goal | • Meet physical activity goal,<br>• Verbal and social persuasion<br>• Step diary and step goal monitor |
| 6. Goal attainment | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Group discuss regarding goal attainment and barriers<br>• Develop and evaluate step goals | • Meet physical activity goal, step diary and step goal monitor<br>• If goal is met, reinforce discussion on elimination of exercise barriers |

| | | | |
|---|---|---|---|
| 7. Reasons to exercise | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Reasons, benefit and barriers to exercise<br>• Feelings of physical activity recall<br>• Discussions incorporated into step goals | • Step diary and step goal monitor<br>• Discussion on elimination of exercise barriers |
| 8. Exercise Barriers | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Feelings of physical activity recall<br>• Discuss on goal attainment and barriers | • Meet physical activity goal<br>• Rewarding self<br>• Verbal and social persuasion<br>• Discussion on elimination of exercise barriers |
| 9. Exercise difficulties | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Recall difficulty when participating in physical activity | • Meet physical activity goal, step diary and step goal monitor<br>• If goal is met, reinforce discussion on elimination of<br>• exercise barriers |
| 10. Other types of physical activity | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Write other types of physical activity<br>• Discussions incorporated into step goals | • step goal monitor<br>• Discussion on elimination of exercise barriers |
| 11. Goal attainment | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Discuss on goal attainment and barriers<br>• Incorporate into step goals | • PDPAR-C<br>• Meet physical activity goal<br>• Rewarding self<br>• Verbal and social persuasion<br>• Discussion on elimination of exercise barriers |
| 12. Review | Knowledge,<br>Outcome expectation,<br>Perceived barriers,<br>Self-efficacy | • Discuss on goal attainment and barriers<br>• Review | • Meet physical activity goal<br>• Rewarding self<br>• Verbal and social persuasion<br>• Discussion on elimination of exercise barriers |
| 13. | Posttest | • Fill out measuring instruments | • BIQ-C<br>• PDPAR-C<br>• Award Presentation |

## APPENDIX D

Assessment of Teaching Objectives for Lesson 1-12

**Teaching Objectives for Lesson 1**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Discuss what physical activity is
- [ ] 3. Describe the in-class assignment of writing about types of physical activity
- [ ] 4. Lead discussion of physical activity

**Teaching Objective for Lesson 2**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Discuss exercise benefits and barriers
- [ ] 3. Describe the in-class assignment of writing about feelings after exercise
- [ ] 4. Lead discussion of benefits and barriers of exercise

**Teaching Objective for Lesson 3**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Introduce the concept of a 10,000 steps for health
- [ ] 3. Discuss subjects stages of change on steps taken
- [ ] 4. Instruct things to do before exercise
- [ ] 5. Describe the in-class assignment of writing about barriers of exercise
- [ ] 6. Lead discussion of barriers of exercise
- [ ] 7. Set step goal

**Teaching Objective for Lesson 4**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Identify exercise opportunities in environment
- [ ] 3. Describe the in-class assignment of writing about what exercise they like and where they can do exercise
- [ ] 4. Lead discussion of possible exercise venues

**Teaching Objective for Lesson 5**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Identify activity goals
- [ ] 3. Discussion on meeting physical activity goal
- [ ] 4. Describe the in-class assignment on step goal
- [ ] 5. Encouragement on reaching step goal

- [ ] 6. Set new step goal

**Teaching Objective for Lesson 6**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Discussion on meeting physical activity goal
- [ ] 3. Discussion on goal attainment and barriers
- [ ] 4. Describe the in-class assignment on step goal
- [ ] 5. Encouragement on reaching step goal
- [ ] 6. Set new step goal

**Teaching Objective for Lesson 7**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Discussion on meeting physical activity goal
- [ ] 3. Describe the in-class assignment on recalling feelings after participating in physical activity
- [ ] 4. Discussion on reasons to exercise
- [ ] 5. Discussion on benefits of exercise
- [ ] 6. Discussion on eliminating barriers of exercise
- [ ] 7. Check own step goal
- [ ] 8. Set new step goal
- [ ] 9. Encouragement on reaching step goal

**Teaching Objective for Lesson 8**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Discussion on meeting physical activity goal
- [ ] 3. Describe the in-class assignment on recalling feelings after participating in physical activity
- [ ] 4. Discussion on eliminating barriers of exercise
- [ ] 5. Check own step goal
- [ ] 6. Set new step goal
- [ ] 7. Encouragement on reaching step goal

**Teaching Objective for Lesson 9**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Discussion on meeting physical activity goal
- [ ] 3. Describe the in-class assignment on recalling difficulty when participating in physical activity
- [ ] 4. Discussion on eliminating barrier of exercise
- [ ] 5. Check own step goal

- [ ] 6. Set new step goal
- [ ] 7. Encouragement on reaching step goal

**Teaching Objective for Lesson 10**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Discussion on meeting physical activity goal
- [ ] 3. Describe the in-class assignment on writing about other types of physical activity
- [ ] 4. Discussion on setting other types of physical activity goal
- [ ] 5. Check own step goal
- [ ] 6. Set new step goal
- [ ] 7. Encouragement on reaching step goal

**Teaching Objective for Lesson 11**

- [ ] Collect subjects' pedometers
- [ ] Discussion on meeting new physical activity goal
- [ ] Describe the in-class assignment on writing about barriers on participating in physical activity
- [ ] Discussion on eliminating barriers of physical activity
- [ ] Check own step goal
- [ ] Set new step goal
- [ ] Reward with small gifts

**Teaching Objective for Lesson 12**

- [ ] 1. Collect subjects' pedometers
- [ ] 2. Describe the in-class assignment on discussion of participating in physical activity in previous weeks
- [ ] 3. Wrap up with what subjects have learned
- [ ] 4. Step review
- [ ] 5. Reward with small gifts

**APPENDIX E**

Social Cognitive Theory based Physical Activity Intervention
Chinese version Self-efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ)

# 「身心健康推廣計劃」

**「你好, 我是浸會大學的(名字)。我將會問你一些有關你身、心健康的問題，亦會問你對運動的看法。你不必回答所有問題，你可以隨時終止我的訪問。訪問中沒有“正確”或“錯誤”的答案，所有答案將絕對保密。我們現在開始吧。」**
**「先由你的個人資料開始吧。」**

**第一部　參加者個人資料**

姓名：_____　腰圍：(吋 Inch)_____

年齡：_____　身高：(米 M)_____

性別：_____　體重：(公斤 Kg)_____

地址：_____

1.你現在住在什麼地方?
1・港島區
2・九龍區
3・新界區

2.你的學歷程度：
1・小學程度
2・中三或以下
3・中五或以下
4・中五或以上

3. 求學時期　你有沒有參加特殊奧運會?
1 有　2 沒有

「你的整體健康狀況開始」

1. 4. 一般來說，你認為你的健康狀況是: 1.極好
2.良好
3.一般
4.差

**第二部 轉變階段**

1. 你經常做運動嗎（每星期三天或以上）？

1 經常 2 很少 3 不知道

| (若受訪者以「經常」作回答，發問以下問題) | (若受訪者以「很少」或「不知道」作回答，發問以下問題) |
|---|---|
| ↓ 「經常」: | ↓ 「很少」或「不知道」: |
| 1c. 你以前做運動維持了多久？<br>1 一個月以下<br>2 一個月以上<br>3 不知道 | 1a. 你想開始經常做運動嗎？<br>1 想立刻開始<br>2 在數個月內開始<br>3 不想開始<br>4 不知道<br><br>1b. 你以前經常做運動嗎？<br>1 是 2 不是 |

**第三部 對運動的認知**

**「我將會說出一些引起你對運動興趣的原因。」**

你認為運動會否：

2. 你認為運動會否 幫助減輕／控制體重？

1 會 2 不會 3 沒意見

3. 你認為運動會否 減少／還是增加疲倦感覺?

1 增加疲倦感覺 2 減少疲倦感覺 3 沒意見

4. 你認為運動會否讓身體 感覺良好／感覺變差?

1 感覺良好 2 感覺變差 3 沒意見

5. 你認為運動會否令你感到心情愉快?

1 會更愉快　　2 不愉快　　3 沒意見

6. 你認為運動會否減少痛楚?

1 會減少痛楚　　2 不會減少痛楚　　3 沒意見

7. 你認為運動會否幫助你認識新朋友?

1 有幫助　　2 沒有幫助　　3 沒意見

8. 你認為運動會否幫助你保持良好身形?

1 有幫助　　2 沒有幫助　　3 沒意見

9. 你認為運動會否有否改善你的樣貌？

1 有改善　　2 沒有改善　　3 沒意見

10. 你認為運動會否令你更健康?

1 更健康　　2 沒有改善　　3 沒意見

**運動障礙指數**

**「我將會說出一些可能影響你做運動的原因。」**

你認為：

11. 你有足夠時間去做運動嗎?

1 足夠　　2 不足夠　　3 沒意見

12. 你想做運動嗎?

1 想　　2 不想　　3 沒意見

13. 你有足夠體力做運動嗎?

1 有足夠體力　　2 沒有足夠體力　　3 沒意見

14. 做運動對你來說悶嗎?

1 悶　　2 不悶　　3 沒意見

15. 做運動會／不會令你更健康嗎?

1 會　　2 不會　　3 沒意見

16. 做運動會令你不舒適／生病?

1 會　　2 不會　　3 沒意見

17. 做運動對你來說困難嗎?

1 困難　　2 不困難　　3 沒意見

18. 你的健康狀況有妨礙你做運動嗎?

1 有妨礙　　2 沒有妨礙　　3 沒意見

19. 你很懶做運動嗎?

1 懶　　2 不懶　　3 沒意見

<u>自我效能</u>

**「我想要知道你對自己做某些運動的能力的認識。」**

你認為你能夠:

20. 你能進行**伸展肌肉**的運動?

1 不肯定　　2 少許可以　　3 肯定可以

21. 你能進行**強化肌肉**的運動?

1 不肯定　　2 少許可以　　3 肯定可以

22. 你能進行會令你大**量排汗**或**深呼吸的運動**, 如: 走路, 游泳或踏單車?

1 不肯定　　2 少許可以　　3 肯定可以

23. 你能使用**健身機械**?

1 不肯定　　2 少許可以　　3 肯定可以

24. 你能使用**健身啞鈴**?

1 不肯定　　2 少許可以　　3 肯定可以

**「謝謝你的參與及分享」**

**APPENDIX F**

Social Cognitive Theory based Physical Activity Intervention
Chinese Version Physical Activity Recall Questionnaire (PAR-C)

第四部份　　體能活動參與狀況

1. 以下問卷目的是估計你過去一天的體能活動量
2. 在每一時段內，先填上你當時正在進行活動的活動編號
3. 然後依據活動程度，在表格內填上「□ˇ」號

活動編號表：

| **A：恆常生活** | **代號** |
|---|---|
| 例子：睡覺 | A |
| 1 換衣服 | A |
| 2 個人護理（如梳理頭髮，刷牙…等） | A |
| 3 洗澡 | A |
| 4 早，午，晚餐 | A |
| 5 小食 | A |
| 6 乘車（如私家車，巴士） | A |
| 7 步行 | A |
| 8 做家務（如打掃，洗碗碟） | A |
| 9 做功課、溫習 | A |
| | |
| **B：餘暇活動（靜態）** | **代號** |
| 例子：聽音樂 、 聽收音機 | B |
| 10 電腦 / 上網 | B |
| 11 看電視、電影 | B |
| 12 電子遊戲機 | B |
| 13 樂器 | B |
| 14 閱讀 （如：書籍、報紙、畫畫） | B |
| 15 談天 、 傾電話 | B |
| 16 四處閒逛 | B |
| 17 其他 （請於空格內註明） | B |

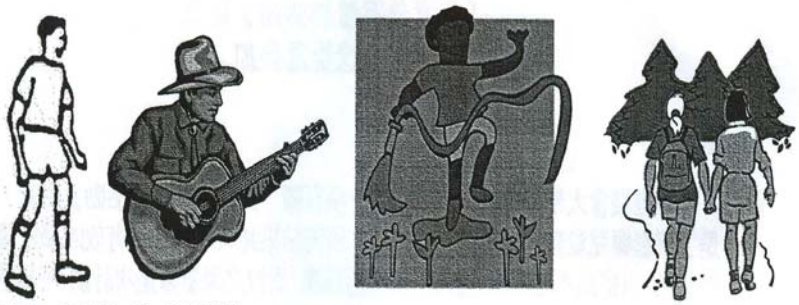
| **C：餘暇活動性（動態）** | **代號** |
|---|---|
| 例子：球類活動 | C |
| 18 跑步 | C |
| 19 單車 | C |
| 20 各類舞蹈（如：芭蕾舞。土風舞） | C |
| 21 體能活動 (如：掌上壓、仰臥起坐) | C |
| 22 水上活動 | C |
| 23 逛街，購物 | C |
| 24 不規則身體活動（如:在公園玩耍） | C |
| 25 其他 （請於空格內註明） | C |

| 活動量編號表： | |
|---|---|
| **活動量** | **代號** |
| 輕 | I |
| 中等 | II |
| 辛苦 | III |

活動程度例子

- *輕 – 慢呼吸,身體只有少量或沒有動作*

- *中等 – 正常呼吸,身體有少量動作*



- *辛苦 – 呼吸加快,中等動作*

過去五天的詳細體能活動量,活動情況
憶述昨天：（請填上活動代號, 活動量代號）

| 第（十二至十三）週 | | 活動代號 | 活動量代號 | 活動代號 | 活動量代號 | 活動代號 | 活動量代號 |
|---|---|---|---|---|---|---|---|
| | 時間 | *星期一* | | *星期二* | | *星期三* | |
| 上班前 | 7:00-7:30 | | | | | | |
| | 7:30-8:00 | | | | | | |
| 下班後 | 4:00-4:30 | | | | | | |
| | 4:30-5:00 | | | | | | |
| | 5:00-5:30 | | | | | | |
| | 5:30-6:00 | | | | | | |
| | 6:00-6:30 | | | | | | |
| | 6:30-7:00 | | | | | | |
| 晚飯時間 | 7:00-7:30 | | | | | | |
| 晚上 | 7:30-8:00 | | | | | | |
| | 8:00-8:30 | | | | | | |
| | 8:30-9:00 | | | | | | |
| | 9:00-9:30 | | | | | | |
| | 9:30-10:00 | | | | | | |
| | 10:00-10:30 | | | | | | |
| | 10:30-11:00 | | | | | | |
| | 11:00-11:30 | | | | | | |
| | 11:30-12:00 | | | | | | |

過去五天的詳細體能活動量,活動情況
憶述昨天：（請填上活動代號, 活動量代號）

| | | 活動代號 | 活動量代號 | 活動代號 | 活動量代號 |
|---|---|---|---|---|---|
| | 時間 | *星期四* | | *星期五* | |
| 上班前 | 7:00-7:30 | | | | |
| | 7:30-8:00 | | | | |
| 下班後 | 4:00-4:30 | | | | |
| | 4:30-5:00 | | | | |
| | 5:00-5:30 | | | | |
| | 5:30-6:00 | | | | |
| | 6:00-6:30 | | | | |
| | 6:30-7:00 | | | | |
| 晚飯時間 | 7:00-7:30 | | | | |
| 晚上 | 7:30-8:00 | | | | |
| | 8:00-8:30 | | | | |
| | 8:30-9:00 | | | | |
| | 9:00-9:30 | | | | |
| | 9:30-10:00 | | | | |
| | 10:00-10:30 | | | | |
| | 10:30-11:00 | | | | |
| | 11:00-11:30 | | | | |
| | 11:30-12:00 | | | | |

**「謝謝你的參與及分享」**

**APPENDIX G**

## 第五部份 數步器步數記錄：

| 第（零 至 一）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |

| 第（一 至 二）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（二 至 三）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（三 至 四）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（四 至 五）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（五 至 六）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（六 至 七）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（（七至八）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（八 至 九）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（九 至 十）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（十 至 十一）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |
| | | | | | |

| 第（十一至十二）週 | *星期一* | *星期* | *星期三* | *星期四* | *星期五* |
|---|---|---|---|---|---|
| 數步器步數記錄（上班時）： | | | | | |
| 數步器步數記錄（下班後）： | | | | | |
| 總數 ： | | | | | |
| 七天平均步數 ： | | | | | |
| 目標步數 ： | | | | | |

你有：

| 現有步數 | 增加 | 目標 |
|---|---|---|
| 8,000 步 | 10% （每兩週） | 增加 800 步 |

| | | |
|---|---|---|
| 8,000 – 10,000 步 | 5% （每週） | 增加 400-500 步 |
| ≧10,000 步 | 保持 | ≧10,000 步 |

| **平均步數：** | | **平均活動量：** |
|---|---|---|
| 靜態 | (每日步數 / <5,000) | Sedentary |
| 不活躍 | (每日步數 / 7,499) | Light |
| 尚算活躍 | (每日步數 / 9,999) | Moderate |
| 活躍 | (每日步數 / 1,0000 – 12,500) | Vigorous |
| 非常活躍 | (每日步數 / >12,5000) | |
| 靜態 | (每日步數 / <5,000) | |

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**APPENDIX H**

English version Self-efficacy, Outcome Expectation and Barrier to Exercise Questionnaire (SOBQ)

Exercise Perception

"I am going to read you some possible reasons why you might want to exercise."

Do you think that exercise would:

EPC1. Help you lose/control your weight or not help you lose/control your weight?

Help Not Help Neither or Both

EPC2. Make you feel less tired or make you feel more tired?

Less Tired More Tired Neither or Both

EPC3. Make your body feel good or not make your body feel good?

Feel Good Not Feel Good Neither or Both

EPC4. Make you feel happier or not make you feel happier?

Feel Happier Not Feel Happier Neither or Both

EPC5. Make you hurt less or not make you hurt less?

Hurt Less Not Hurt Less Neither or Both

EPC6. Help you meet new people or not help you meet new people?

Help Not Help Neither or Both

EPC7. Help you get in shape or not help you get in shape?

Help Not Help Neither or Both

EPC8. Make you look better or not make you look better?

Look Better Not Look Better Neither or Both

EPC9. Improve your health or not improve your health?

Improve Not Improve Neither or Both

Barriers to Exercise

"I am going to read you a list of things that might or might not make it hard for you to exercise."

Do you think that:

BE1. Exercise costs too much money or that it doesn't cost too much money?

It Does It Doesn't Neither or Both

BE2. It's hard to find a way of getting to an exercise program or it is not hard to get to an exercise program?

Hard Not Hard Neither or Both

BE3. You don’t have enough time to exercise or that you do have enough time to exercise?

Not Enough Enough Neither or Both

| | | | |
|---|---|---|---|
| BE4. | You feel like exercising or you don't feel like exercising? | | |
| | Feel Like | Don't Feel Like | Neither or Both |
| BE5. | You get too tired to exercise or that you do not get too tired to exercise? | | |
| | Too Tired | Not too tired | Neither or Both |
| BE6. | Exercise is boring or not boring? | | |
| | Boring | Not boring | Neither or Both |
| BE7. | Exercise will not make you healthier or that it will make you healthier? | | |
| | Not Healthier | Healthier | Neither or Both |
| BE8. | Exercise will make you sick or that it will not make you sick? | | |
| | Sick | Not Sick | Neither or Both |
| BE9. | Exercising is too hard or that it is not too hard? | | |
| | Hard | Not Hard | Neither or Both |
| BE10. | You don't know how to exercise or you do know how to exercise? | | |
| | Don't know how | Know How | Neither or Both |
| BE11. | You don't know where to exercise or you do know where to exercise? | | |
| | Don't Know Where | Know Where | Neither or Both |
| BE12. | Your health keeps you from exercising or does not keep you from exercising? | | |
| | Keep from exercising | Not keep from exercising | Neither or Both |
| BE13. | You are too lazy to exercise or that you are not too lazy to exercise? | | |
| | Too lazy | Not too lazy | Neither or Both |
| BE14. | You don't have anyone to do exercise with you or that you do have someone to exercise with? | | |
| | Don't Have | Do Have | Neither or Both |
| BE15. | The equipment (like machines/weights) is hard for you to use or not hard for you to use? | | |
| | Hard | Not Hard | Neither or Both |
| BE16. | People might make fun of you or do you not worry that people might make fun of you? | | |
| | Worry | Not worry | Neither or Both |
| BE17. | You don't have anyone to show you how to exercise or that you do have someone to show you how to exercise? | | |
| | Don't have | Do have | Neither or Both |
| BE18. | You would have a hard time using a fitness center (health club, YMCA, park district) or not have a hard time using a fitness center? | | |
| | Have hard time | You can | Neither or Both |

Self-Efficacy to Perform Exercise Regularly

"I would like to know how sure you are that you can do certain activities."

Do you think that you can:

SEE1. Do exercises to stretch your muscles?

Not at all Sure A Little Sure Totally Sure

SEE2. Do exercises to make your muscles stronger?

Not at all Sure A Little Sure Totally Sure

SEE3. Do an exercise that makes you sweat or breathe hard, such as walking, swimming, or bicycling?

Not at all Sure A Little Sure Totally Sure

SEE4. Do you think you can use an exercise machine?

Not at all Sure A Little Sure Totally Sure

SEE5. Do you think you can exercise with weights?

Not at all Sure A Little Sure Totally Sure

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