“eSPECIALly fit”: A Tailored Exercise Program for People with an Intellectual Disability

by

Michelle Lynnes
BA, University of Victoria, 2004

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Abstract

People with an intellectual disability have high levels of sedentary behaviour (Temple, Frey, & Stanish, 2006) and health conditions associated with inactivity such as cardiovascular disease (Draheim, 2006) and obesity (Rimmer & Yamaki, 2006). Physical activity has been identified as one of the most successful strategies used to decrease these health risks. Four participants with an intellectual disability were recruited from the Special Olympics Athletic Club and participated in a 9-week strength and aerobic exercise program which consisted of a face-to-face program and an at-home component. During the face-to-face program participants took part in an aerobic warm up, strength training using exercise bands, skill development, and games. The strength skills were introduced progressively over the 9-weeks and were analyzed for mastery at the end of each face-to-face session using a procedural task analysis check list. Mastery was reached if participants completed a skill three consecutive times with no prompting. However, once a skill was completed with no more then visual prompting it was added to the at-home component of
the program. At the end of each face-to-face session participants planned two additional days per week to exercise in their homes. The at-home component included an interactive exercise DVD that mirrored the strength and aerobics exercises introduced at the face-to-face program.

Completion of the planned exercises was confirmed by self-report in log books and conversation with the researcher during prompting telephone calls. Pre and post tests for self-efficacy and a program satisfaction questionnaire were also conducted. Three participants reached mastery for biceps curls and one participant reached mastery for triceps extensions and back leg raises. Three participants completed all six strength exercises and one participant completed four exercise skills with no more than visual prompting. Participants required less prompting as the weeks progressed even with an increase in the number of skill components being tested. Adherence to the at-home component of the program for each participant was: 100%, 94%, 94%, and 28%. A dependent t-test revealed that self-efficacy toward exercise did not significantly increase from pre-test ($M = 12.1$) to post-test ($M = 13.3$) $t (3) = 2.03, p = .14$. These findings suggest that adults with an intellectual disability can acquire exercise band strength skills in a relatively short period of time and some participants are able to utilize these skills consistently at home. Participants in the current study failed to improve their self-efficacy toward exercise; however pre-test self-efficacy scores were quite high.
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Chapter One: Introduction

Introduction

Individuals with an intellectual disability have earlier mortality and a higher prevalence of serious health conditions than the general population (Draheim, Williams, & McCubbin, 2002; Pitetti & Campbell, 1990). This population has high levels of obesity (Rimmer & Yamaki, 2006), cardiovascular disease (Draheim, 2006), osteoporosis (Felix, McCubbin, & Shaw, 1998), and type II diabetes (Draheim, McCubbin, & Williams, 2002); all of which have been linked to a sedentary lifestyle. Researchers have suggested that more then two-thirds of people with mild to moderate levels of an intellectual disability do not participate in adequate levels of physical activity for improvements in health (Temple et al., 2006).

There is overwhelming evidence that physical activity can decrease the risk of cardiovascular disease, type 2 diabetes, and obesity in the general population (Health Canada, 2007; Warburton, Nicol, Whitney, & Shannon, 2006). Although only a limited number of research studies have specifically examined the benefits of exercise for people with an intellectual disability, these studies suggest that the benefits are comparable. Similar to the general population, regular participation in exercise intervention programs for people with an intellectual disability can generate improvements in cardiovascular fitness and muscular strength (Rimmer, Heller, Wang, & Valerio, 2004), psychosocial well being (Heller, Hsieh, & Rimmer, 2004), and facilitate a decrease in bodyweight (Heller et al., 2004).

Although limited research has examined the acquisition and transfer of specific exercise skills, individuals with an intellectual disability can successfully learn new recreational physical activity skills and transfer them to new situations (Choi, Meeuwsen, French, Sherill, & McCabe, 2001; King & Mace, 1990; Zhang, Cote, Chen, & Liu, 2004). Evidence also suggests that people
with an intellectual disability can successfully complete and participate in physical activity/exercise programs with varying levels of support and different mediums of instruction (e.g. face-to-face, via video). Both Pitetti and Tan (1991) and King and Mace (1990) used a minimal instruction and prompt fading procedure to examine participants’ ability to complete an exercise program with little or reduced support. They found that in each case the participants were successful at completing the programs with minimal support (i.e. instruction and/or prompting behaviour). Another study by Stanish, McCubbin, Draheim, and van der Mars (2001) showed that people with an intellectual disability were able to follow an aerobic dance program via video instruction with a minimal amount of face-to-face support.

Although research suggests that people with an intellectual disability can learn new physical activity skills and participate in exercise programs with limited amounts of support; transferring these skills to new settings and adhering to programs after the termination of face-to-face scheduled programs has been problematic. Cluphf, O’Connor, and Vanin (2001) found that six weeks after the termination of an aerobic dance program, participants did not continue to exercise. These findings were supported by Pitetti and Tan (1991), who found that none of their participants continued to exercise after their work place exercise intervention, even though they had significantly increased exercise levels during the intervention. Research suggests that there are a number of perceived barriers that may influence a persons’ continuation in exercise.

Individuals who are less active tend to report more barriers to physical activity then those who are more active (Temple, 2007). The most significant perceived barriers to physical activity and exercise for people with intellectual disabilities include; lack of social support, a need for direct supervision, a lack of motivation, and a lack of financial support (Prasher & Janicki, 2002; Rimmer, 1996).
Research has shown that individuals with an intellectual disability can adhere to face-to-face exercise programs when they are provided with adequate amounts of support and when equipment is made readily available. As well, administering direct and instant rewards such as a token economy, medals and certificates have been effective at promoting program adherence (Weiss, Diamond, Denmark, & Lofalv, 2003) and a token economy (Cluphf et al., 2001). Yet once face-to-face programs are completed, the social support, easy access to equipment and the instant rewards are no longer available. As suggested by Stanish and colleagues (2001) in order to encourage life-long exercise participation research is needed on the effectiveness of programs that provide indirect support, limited supervision, limited rewards and alternative settings to face-to-face exercise programs.

It is well documented that people with an intellectual disability have high levels of sedentary behaviour (Temple et al., 2006) and increased risk for health conditions associated with inactivity (Draheim, 2006; Rimmer & Yamaki, 2006). Increasing levels of physical activity is a primary way of counteracting health concerns (Health Canada, 2007) and preventing secondary disabling conditions (Rimmer & Yamaki, 2006) for people who are inactive. Tailoring intervention programs that address individual needs has the potential to change physical activity behaviour (Van der Ploeg et al., 2006). The literature pertaining to exercise interventions for people with an intellectual disability are modest and focus on face-to-face intervention programs. Further research is needed to address the issue of behaviour change for people with an intellectual disability with regards to the acquisition of specific exercise skills and the adherence to programs that use other mediums than face-to-face delivery.
Rationale

Many individuals with an intellectual disability do not meet recommended levels of physical activity for good health, resulting in a high prevalence of health conditions such as cardiovascular disease and type II diabetes (Draheim, 2006; Rimmer & Yamaki, 2006). Participation in physical activity and specifically exercise for individuals with an intellectual disability has been found to improve health by successfully increasing aerobic fitness (Tsimaras, Angelopoulou, Efstratopoulou, & Mandroukas, 2001), strength (Rimmer et al., 2004) and psychological wellbeing (Heller et al., 2004). Research has shown that for this population physical activity skills can be acquired and transferred to new situations (King & Mace, 1990) and that adherence to face-to-face physical activity and exercise programs can be obtained (Pitetti & Tan, 1991; Stanish et al., 2001). A major concern with many programs is a lack of adherence to exercise after the completion of the face-to-face delivery, due to lack of access and social support. Providing individuals with intellectual disabilities the skills, accessibility and support to exercise independently in their homes may encourage a more consistent pattern of exercise participation. Yet there is no published evidence that if access and support is provided, exercise skills acquired through face-to-face programs can be successfully transferred to the home and if adherence to a home-based program can be obtained.

Aim

The primary aim of this study is to examine whether ‘eSPECIALly fit’ (here after referred to as the program), a supervised strength and cardiovascular exercise program, can successfully facilitate the development of strength training skills and a higher level of self-efficacy in adults with an intellectual disability. Secondarily, the study aims to determine whether, with indirect support and availability of equipment, adults with an intellectual disability
can transfer these strength skills to their home and adhere to a planned at-home exercise program.

**Research Questions**

1. Can the face-to-face program facilitate mastery of six exercise band strength skills for people with an intellectual disability?
2. Will participants be able to transfer the skills learned at Special Olympics to the home environment with the support of an interactive DVD and telephone prompting?
3. How closely does the planned physical activity correspond to completed physical activity for the week?
4. Can the program increase a participant’s level of self-efficacy with regards to: specific strength exercises and general physical activity?
5. Will the participants be satisfied with the delivery and content of the program?

**Assumptions**

1. Participants will become familiar with the measurement and testing procedures, including the self-efficacy, strength questionnaires and the skill checklists.
2. Participants will try to complete tasks to the best of their ability.

**Delimitations**

1. Adults (age > 18) who participate in the Victoria Special Olympics Athletic Club from January to March, 2008.

**Limitations**

1. There is the potential for the participants to lose interest and drop out of the study.
2. The results of the self-efficacy questionnaires rely on the subjective responses of the participants.
3. The information in the activity logs is a subjective report by the participants.

   Operational Definitions


2. Self-efficacy- a person’s perception of their own ability to complete a task (Bandura, 1997). This will be measured using a self-efficacy questionnaire developed and validated for people with an intellectual disability (Heller et al., 2004).

3. Adherence
   - Program adherence: The percentage of days attended for the face-to-face exercise classes.
   - Home adherence: The percentage of days planned vs. days completed of the take-home component of the program. This will be measured using the activity logs.

4. Skill level- The percentage of the skill components that were mastered successfully with no prompting with regards to the skill checklists.

5. Mastery- completion of all components of a skills checklist with no prompting (score of 100%) on three consecutive testing occasions. Mastery of skill acquisition has been defined as the ability to perform a skill with no monitoring or prompting at any time (Williams & Hodges, 2004). Repetitions of successful attempts at a skill are needed to accurately determine skill development and mastery. Other research has indicated that at least three testing sessions is required for optimal familiarization of a skill or procedure (Rintala, McCubbin, & Dunn, 1995).
Chapter 2: Review of Literature

This chapter contains a review of the literature with regards to health risks and exercise interventions for people with an intellectual disability. It is organized with a discussion of health risks for this population, followed by a discussion of benefits of physical activity, and recent physical activity interventions.

Health Risks

People with an intellectual disability have earlier mortality and a greater onset of health problems when compared to the general population in the same age categories (Patja, Livanainen, Vesala, Oksanen, & Ruoppila, 2000). They have higher risks of cardiovascular disease (Draheim, 2006) osteoporosis (Felix et al., 1998; Foster, Walkley, & Temple, 2001), and type 2 diabetes (Draheim, Williams et al., 2002). A recent review by Draheim (2006) examined the prevalence, related mortality, and physiological factors affected by cardiovascular disease in people with an intellectual disability. Draheim found that cardiovascular related deaths are continuing to rise for people with an intellectual disability, more so than the general population.

Obesity and overweight have been identified as a risk factor for type 2 diabetes, high cholesterol, coronary heart disease, and osteoarthritis (Must et al., 1999; Pi-Sunyer, 1999). There is little research on the obesity levels of people with an intellectual disability in Canada, however, evidence from a review from other developed countries suggests that people with an intellectual disability have high levels of overweight and obesity (Rimmer & Yamaki, 2006). These authors found that in many countries obesity levels are significantly higher in people with an intellectual disability when compared with their same age counterparts; with people with Down syndrome having the highest rates of overweight and obesity (Rimmer & Yamaki, 2006). Rimmer et al. (2004) examined the obesity and activity levels of people with Down syndrome
and found that 80% of women with Down syndrome were obese or overweight making them vulnerable for poor health.

Benefits of Physical Activity

The Surgeon General of the United States (2001) and Health Canada (2007) suggest that physical activity is one of the most successful practices for managing obesity and related health concerns, yet in Canada 51% of the adult population is inactive and do not meet recommended physical activity levels (Warburton et al., 2006). Participating in adequate amounts of physical activity can decrease the risk of cardiovascular related deaths by up to 50% (Warburton et al., 2006). Lifestyle interventions focusing on physical activity have demonstrated reductions in the prevalence of type 2 diabetes, cardiovascular disease (Warburton et al., 2006), and osteoporosis (Lui, Qin, & Chan, 2008). Physical activity has also been used as a primary treatment, preventative tool, and management technique for decreasing levels of obesity (United States Department of Health and Human Services, 2001). Participation in physical activity also decreases levels of depression and stress, and can increase self-efficacy and self-concept (Health Canada, 2007). Recent research has suggested that the benefits of physical activity for people with an intellectual disability are similar to that of the general population (Rimmer et al., 2004).

Physical Activity and Fitness Levels in People with an Intellectual Disability

Levels of inactivity and sedentary behaviour among people with an intellectual disability are of concern to health professionals. A review of the literature examining the physical activity levels of adults with an intellectual disability concluded that approximately two-thirds of participants are not sufficiently active to achieve health benefits (Temple et al., 2006). Although many studies suggest that the physical activity levels of people with an intellectual disability are lower than that of the general population (Draheim, Williams et al., 2002; Stanish & Draheim,
2005), Temple and colleagues suggest there are insufficient data to support this claim. However, it is evident that the majority of ambulatory people with an intellectual disability do not meet recommended levels of physical activity (Stanish, Temple, & Frey, 2006).

Along with low levels of physical activity and high levels of sedentary behaviour, many people with an intellectual disability have poor levels of fitness (Rimmer & Hiss, 2005). In Canada, Graham and Reid (2000) studied a cohort of adults with an intellectual disability for 13 years and compared the results to the data collected on over 9000 men and women for the Canadian Fitness Survey. Graham and Reid showed that the fitness of people with an intellectual disability was lower than the comparison group at the beginning of the study and there was a greater increase of body mass index and percentage of body fat over the years. They also found that women with an intellectual disability had significantly lower levels of cardiovascular fitness and trunk strength compared to the general population. These Canadian data are supported by findings from the United States. Rimmer and Hiss (2005) reviewed 32 descriptive studies related to fitness levels of people with an intellectual disability. They concluded that the majority of people with an intellectual disability have fitness levels that are below average. Specifically, the participants in the studies reviewed had: low levels of cardiovascular fitness and strength, high body fat, and high recorded energy exertion for physical activity performance.

**Barriers to Exercise Participation**

Individuals who are less active tend to report greater barriers to physical activity than those who are more active (Temple, 2007). Temple and Walkely (2007) conducted six focus group interviews with adults with an intellectual disability and their caregivers to discuss barriers and enabling factors to participation in physical activity. They identified three emerging themes: motivation, financial support and social support. First they found that the caregivers identified
their clients’ desire and preference for sedentary behaviour. Although contrary to the clients perceptions, the caregivers felt that their clients’ lack of participation in physical activity was a result of a lack of motivation. The clients did not identify their lack of motivation as a barrier to physical activity and in contrast they reported positive feelings towards physical activity participation. Those participants who reported losing motivation towards a certain activity identified external barriers, such as a lack of support or a frustration with lack of knowledge of equipment.

Another identified barrier is financial and political support. Participants identified cost to external physical activity opportunities as a barrier to participation (Messent, Cooke, & Long, 1999). Not just the cost of admittance to a program, but the cost of providing transportation and adequate amounts of space in the programs (Temple & Walkley, 2007). In some day programs, clients are only given limited activity selections and may not be able to choose their preferred activities. Even if a client was motivated to continue participation in an exercise program, they may unable to do so due to lack of space or resources (Temple & Walkley, 2007). Other research has also identified financial constraints as a barrier to physical activity for adults with an intellectual disability (Messent et al., 1999). Many group homes report a lack of finances that directly effects their staffing and availability of resources. In many community settings staff find it difficult to promote physical activities due to their own occupational constraints. Work conditions often include: long hours, insufficient staff-client ratios, and lack of resources (Messent et al., 1999).

In a descriptive study in Northern England, 24 adults with an intellectual disability living in community settings and their caregivers reported insufficient staffing as a significant barrier to physical activity participation (Messent et al., 1999). This was similar to Temple and Walkley
(2007) results who found that staff members often had multiple clients in their care with a variety of different needs. The staff members often had to choose activities to meet the needs of the entire group with regards to safety and preference. Physical activities were often not chosen due to low staff to client ratios and lack of interest from the majority of clients.

Social support and exercise companions are positively associated with participation in physical activity programs (Wendel-Vos, Droomers, Kremers, Brug, & van Lenthe, 2007). Temple and Walkely (2007) identified social support as one of the other primary barriers to physical activity for people with an intellectual disability. This is supported by other researchers who have found that low levels of social support negatively influences personal choices with regards to physical activity (Frey, Buchanan, & Rosser Sandt, 2005; Temple & Walkley, 2007). One study examined the relationship between physical activity and current perceptions of: barriers, enjoyment and preference, using pedometers and surveys. They found that participants who recorded lower step counts (<5000 steps/day) identified “no one to exercise with” and “other people stop me” as significant barriers to physical activity more so then those who had high step counts (> 10 000 steps/day) (Temple, 2007).

In group homes caregivers are often the most direct mode of social support, yet they can create barriers to physical activity. Messent and colleagues (1999) examined the job descriptions of staff in the community settings and found no declaration of physical activity promotion. The staff interviewed recognized the importance of physical activity, but acknowledged the lack of promotion due to staffing and resource limitations. This finding is supported by Temple and Walkley (2007) who reported that residential care staff felt that promotion of physical activity among group home residents with intellectual disability was not their responsibility. Of even greater concern, Frey, Buchanan, and Rosser Sandt (2005) found that in some cases doctors,
teachers and coaches of people with an intellectual disability discouraged participation in physical activity due to fear of physical over-exertion. These authors found that positive choices regarding physical activity for people with an intellectual disability were less likely when staff members, care givers, doctors and coaches did not provide social support or encourage positive physical activity behaviour.

**Integrated Model of Physical Activity and Disability**

Van der Ploeg, van der Beek, van der Woude, and van Mechelen (2004) developed an integrated conceptual model of physical activity and disability (see Appendix A). The model combines the Attitude, Social Influence and Self-efficacy model (ASE) (DeVries, Dijkstra, & Kuhlman, 1988) and the Model of Functioning and Disability (ICF) (2001). The ICF model is the revised version of the Impairment, Disability and Handicap (ICIDH) model, which was one of the two predominant models for classifying disabilities and determining function. The main reason for the revision was due to the lack of attention to the environment and the unclear description of the relationship between components of the model. The ICF model describes a dynamic relationship between an individual’s level of functioning, the environment, and personal characteristics. The environment encompasses physical, social, and attitudinal components. The personal characteristics include an individual’s history and their present status including: education, sex, race, age, social status, profession, and experiences.

The ASE model (DeVries et al., 1988) combines factors from the Social Learning Theory (Bandura, 1997), the Transtheoretical Model (Buckworth, 2000), and the Theory of Planned Behaviour (Ajzen & Driver, 1992). The ASE model focuses on the three predominantly identified determinants: attitude, social influence, and self-efficacy. Social influence includes the perceptions of appropriate activity levels for an individual by other people. Attitude refers to an
individual’s perception of physical activity. Self-efficacy is an individual’s belief in themselves that they can successfully complete the given physical activity task source (Bandura, 1997). In this model, environmental factors indirectly play a role in individuals’ levels of physical activity by directly influencing one of the three main determinants.

Van der Ploeg et al. (2006) integrated the ICF model with the ASE model in order to provide a conceptual model of physical activity that is specifically targeted to people with a disability. This integrated model, called the Physical Activity and Disability Model (PAD) distinguishes between levels of physical activity functioning, environmental and personal factors. This model states that an individual’s level of functioning is influenced by their body functions and structures, the given activity and the individual’s participation level. The environmental factors include social influences, and environmental facilitators. Personal factors include demographics, biological, behaviour, and cognitive aspects.

The goal of the PAD model is to identify the variables and determinants that influence the physical activity behaviour of people with disabilities. The PAD model is relatively new and evidence of its use it limited. However, the model has recently been used as the theoretical framework of a large scale physical activity intervention study conducted by ten Dutch Rehabilitation centers (Van der Ploeg et al., 2006). The researchers examined the effects of combining a sport stimulation program and a daily physical activity program nine weeks after participants had completed rehabilitation. The programs incorporated aspects of the PAD model focusing on tailoring programs for each individual. The programs identified sport history, intent, possibilities, and barriers and used the information to recommend activities for each individual. They also provided participants with the social support required to participate by providing referrals, information packages, and three telephone counselling sessions to identify physical
activity status, use of resources, lingering barriers, and possible solutions. The researchers found that the group who participated in both the sport stimulation and the daily physical activity program had a greater increase in physical activity and sport participation than the groups that participated in the sport stimulation only or the daily physical activity only. Thus the PAD has been successfully used as a conceptual model to create tailored intervention programs by identifying the environmental and personal factors and the combination of them in order to minimize the barriers and promote positive physical activity behaviour (Van der Ploeg et al., 2004).

Conceptually the PAD model provides a good basis for designing physical activity and/or exercise programs for individuals with intellectual disabilities. As the model shows, the levels of physical activity functioning is influenced by their current participation; their level of functioning with regards to their ability to comprehend rules, safety precautions, and regulations; and the specific activities. The activities they participate in must be obtainable and appropriate for their level of functioning, current fitness, and personal interests. As discussed earlier, many environmental factors influence the participation level of people with an intellectual disability. These include lack of transportation, equipment and support (Temple & Walkley, 2007), as well as negative perceptions and lack of physical activity promotion by doctors, caregivers, and families (Frey et al., 2005). The PAD model shows that personal factors also need to be considered and it has identified motivation and health as potential barriers to physical activity. The most predominant personal factor self-efficacy (Trost, Owen, Bauman, Sallis, & Brown, 2002) is strongly associated with activity behaviour. Similar to the theory of planned behaviour (Ajzen & Driver, 1992) this model shows self-efficacy indirectly influencing behaviour, by directly influencing intention, suggesting that as a person’s level of self-efficacy for a specific
skill increases their intention to perform that skill will increase. Although the PAD appears to be a conceptually sound model more programs developed using the PAD need to be researched in order to determine effectiveness.

**Physical Activity and Exercise Intervention Programs**

The majority of physical activity or exercise programs developed for people with an intellectual disability focus on increasing fitness (Pitetti & Tan, 1991; Tsimaras et al., 2001); specifically cardiovascular fitness and strength. Tsimaras and colleagues (2001) evaluated the cardiovascular fitness benefits of a 12-week (3 days per week) training program of adults with and without an intellectual disability. Although the improvement was larger in the group without intellectual disabilities, they found that both groups significantly improved on cardiovascular measurements and total time of exercise participation. These authors suggested that a well rounded and efficient training program can help improve cardiovascular capacity. This is supported by findings from a recent review of the literature on physical activity and fitness among adults with intellectual and developmental disability (Rimmer & Hiss, 2005), which reported that training improved cardiovascular measures (including oxygen consumption, exercise duration, workload, distance covered) for the participants.

Resistance training can improve muscular strength, muscular endurance, and cardiovascular capacity and reduce the risk of injury. Two manuscripts from a study conducted at the University of Illinois that involved a 12-week, three days per week, exercise and nutrition program to 53 adults with Down syndrome, demonstrated positive psychosocial (Heller et al., 2004) and fitness (Rimmer et al., 2004) outcomes, respectively. The program included strength training, aerobic exercise, and health education. The participants completed three sessions per week. Each session included an hour exercise program and an hour health education class.
During the exercise program participants were taught how to use standard exercise equipment and how and when to contact staff if they needed help. They also participated in 35 minutes of aerobic exercise and 14 minutes of strength training. Rimmer and colleagues (2004) reported improvements in VO$_2$ peak, peak heart rate, time to exhaustion, and maximum workload. In addition, the results revealed an increase in lower leg (39%) and upper body (43%) strength following the intervention. These findings are supported by Stopka et al. (1994) who found that a 23-week supervised resistance training program for adolescents with a moderate to severe intellectual disability could lead to strength gains. Other studies have reported increases in strength during aerobic programs that do not incorporate in specific weight training programs (Chaniais, Reid, & Hoover, 1998; Rimmer et al., 2004).

*Exercise Interventions and Self-efficacy*

One of the most predominate theories used to explain exercise behaviour is the Social Cognitive Theory (Bandura, 1997). This theory suggests that there is a constant and reciprocal interaction between behaviour, environment, and personal factors (Buckworth, 2000). The dominant variable in this theory is self-efficacy which is defined as an individuals’ confidence in their ability to perform a given task (Bandura, 1997). Bandura states that a persons’ confidence in their ability to master a skill, affected both the adoption and maintenance of a behaviour, and is directly associated with the choice of behaviour and the setting in which it was carried out. Once the behaviour has been initiated, a person’s level of self-efficacy can influence the length of time and the dedication allotted toward a behaviour. The greater a person’s self-efficacy the more likely they are to persevere when faced with obstacles and negative affects during the behaviour.
A person’s level of self-efficacy is influenced by four major sources: performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1997). Performance accomplishments refer to personal mastery and positive experiences related to the behaviour. This source is thought to carry the most weight with regards to self-efficacy. Continued achievements during a behaviour will increase self-efficacy, while continued failures will decrease self-efficacy. Positive performance accomplishments are thought to be very important during the adoption of behaviour. Once a high level of self-efficacy is established occasional failures are likely to be less detrimental then if they occurred during the initial stages. Vicarious experiences refer to experience through watching others partake in the desired behaviour. For example, if a person watches others succeed at an exercise program they may convince themselves that if those modeling can do it then they can also do it. The more obvious the behaviour and the response the more significant it is to self-efficacy development. Verbal persuasion is when others suggest that a given behaviour will elicit a certain outcome. This source of information is not as influential, because the person has no direct experiences to relate to. Emotional arousal refers to a person’s physiological state during a behaviour. If a person has high anxiety when exercising in a weight room, they are not likely to have a high self-efficacy for that behaviour. Two reviews have shown that self-efficacy is one of the most significant predictors of exercise adoption and adherence for a wide range of populations including, children, adolescence, adults, older adults and special populations (McAuley & Blissmer, 1999; Trost et al., 2002).

Self-efficacy is a significant psychosocial predictor of current physical activity and exercise behaviour (Trost et al., 2002). Granner, Sharpe, Hutto, Wilcox, and Addy (2007) administered a random-digit-dial questionnaire to 2025 adults to examine the perceived
individual, social and environmental factors that effect physical activity and walking behaviour. They found that self-efficacy was the strongest correlate of physical activity compared to other social and environmental factors including exercise partners, number of recreation facilities accessible, and number of known walking routes. Other research has found that during a long-term follow up after the termination of a physical activity program, self-efficacy is a significant predictor of current and continued activity (McAuley & Blissmer, 1999).

Research has corroborated that self-efficacy increases as people move from a sedentary to an active lifestyle. Some research has found that self-efficacy plays a more significant role in exercise adoption than in exercise maintenance. Self-efficacy is positively correlated with the move from sedentary to exercise adoption. With people who have adopted an exercise regime having a higher level of self-efficacy than those who have limited or no involvement in exercise. Researchers suggest that self-efficacy is still important for the maintenance of exercise, but it plays a less significant role than adoption of exercise (Oman & King, 1998).

Little research has looked specifically of the role of self-efficacy and people with an intellectual disability due to the difficulty in determining accurate measurement. Two sets of researchers have developed scales to measure self-efficacy in people with intellectual disabilities (Kojima, Ikeda, Kanno, Hashimoto, & Hosokawa, 2001; Marks, Heller, & Sisirak, 2001). Heller and colleagues developed a self-efficacy questionnaire for people with an intellectual disability for their Exercise and Nutrition Health Education Curriculum for People with Developmental Disabilities. The scale looks specifically at the participants’ confidence in completing cardiovascular and strength exercises. They found a reliability score of 0.91 and a test-retest correlation of 0.52 ($p < .01$). A study by Kojima and colleagues tried to develop a generalized
self-efficacy scale for people with disabilities. They found that people with a mental age of 6 or greater could reliably report and complete the self-efficacy scale.

As previously discussed, the University of Illinois (Heller et al., 2004; Rimmer et al., 2004) study demonstrated that similar to the general population self-efficacy is a determinant of exercise for people with an intellectual disability. The researchers found that self-efficacy was significantly higher in the participants in the intervention program versus those in the control group after the termination of the program. In the PAD model self-efficacy (Van der Ploeg et al., 2004) is identified as a personal factor that indirectly influences the amount of participation in physical activity by directly influencing intention (Van der Ploeg et al., 2004). If a person has low self-efficacy toward a specific program/behaviour they are less likely to have a positive intention to engage in that activity. By developing programs that provide participants with the support and resources aimed at successful participation their self-efficacy toward that activity will increase and their intention toward participation in that activity will be more positive.

Skill Training

Successful participation in exercise and physical activity requires the acquisition and transfer of new skills. There have been three studies that have specifically evaluated the development and transfer of novel skills for people with an intellectual disability in physical activity contexts (Choi et al., 2001; King & Mace, 1990; Zhang et al., 2004). The first study examined the ability of people with severe intellectual disability to acquire, retain, and transfer a motor skill to a novel situation (Choi et al., 2001). The participants learned and practiced throwing a beanbag at three different targets at varying distances. After the participants had successfully acquired the skill they were given four novel situations which required the skill of throwing an object. The new situations included, throwing a beanbag at a target with a new
distance that had not been practiced and throwing a different object (horse shoe) at one of the practiced distances. The researchers found that participants were able to transfer the underarm throwing skill to the novel situations.

The second study by Zhang and colleagues (2004) involved teaching a 39-year-old male with severe intellectual disability a recreational bowling skill using system of least prompts procedure. The participant attended 32, twenty minutes sessions. The skill was taught sequentially, with each portion being prompted by a verbal cue followed by a physical cue when necessary. A 5-second time delay was used between each verbal cue to encourage the participant to initiate the correct response. If the participant completed a step incorrectly they were stopped immediately and the trainer returned to physical assistance. Zhang and colleagues found that the participants’ level of correct responses increased with the use of the system of least prompts, and the verbal cues were eventually faded out. The participant learned the recreational bowling skill by the end of the 32nd week of training, which suggests that using a system of least prompts procedure may increase an individual’s ability to learn a task.

In the third study, King and Mace (1990) taught three older adults with moderate and severe intellectual disabilities exercise skills that they could use in integrated settings. Their exercise program included prompts, contingent praises, and delayed reinforcement, all of which were gradually faded out. The prompt fading procedure slowly decreased the level of immediate support to the participants. This was done to evaluate the participants’ ability to complete the skills with the support similar to an integrated exercise program. Using the prompt fading procedure was effective; the participants were able to maintain between 82% and 95% of these skills nine month after the instruction.
Promoting Exercise Adherence

People with an intellectual disability can successfully participate in a variety of face-to-face aerobic and strength programs with varying levels of support. King and Mace (1990) found that their participants could successfully learn and participate in an aerobic program using a prompt fading procedure. Pitetti and Tan (1991) examined the effects of a minimally supervised 16-week aerobic exercise program on a Schwinn Air-Dyne ergometer. They found that with minimal prompting, participants were still able to successfully participate in stationary cycling and were able to improve their cardiovascular fitness. Another study examined the use of a video led exercise program. Stanish and colleagues (2001) examined the different levels of support within instruction of an aerobic dance class for people with an intellectual disability. They compared a video led and a leader instructed dance program. These authors found no significant difference between the two modes of instruction. Regardless of the mode of instruction 75% of the participants attended each of the sessions.

Research has shown that people with an intellectual disability can successfully learn new skills (Choi et al., 2001; King & Mace, 1990; Zhang et al., 2004), participate successfully in aerobic and strength programs (Rimmer et al., 2004), and attend programs regularly (Stanish et al., 2001). However, the majority of the studies found that participation rarely continued beyond the face-to-face sessions. Cluphf et al. (2001) found that six weeks after the termination of an aerobic dance program the participants did not continue to exercise. These findings were supported by Pitetti and Tan (1991) who found that after the termination of their work place exercise intervention, only a few of the employees continued to exercise and eventually they also stopped. They suggested that the need of social support and guidance may be important to encourage continued participation.
Summary

Many people with an intellectual disability are inactive and have health conditions associated with inactivity, including: cardiovascular disease, type 2 diabetes, and obesity. Physical activity and exercise are recognized as a primary management and preventative technique for these health conditions. Physical activity has also been found to increase psychological wellbeing with regards to self-efficacy, self-concept, and general self-worth. Research on physical activity programs for health for people with an intellectual disability is limited. However studies have shown that people with an intellectual disability can acquire new skills, transfer skills to new situations, and adhere to a face-to-face exercise intervention programs. Of concern however, is that people with an intellectual disability do not continue to exercise after the termination of face-to-face programs. This study will extend the research that has been conducted to date by implementing a face-to-face exercise intervention that specifically fosters transfer of exercise skills to the home environment. Once strength and aerobics skills are acquired at Special Olympics participants will be encouraged to transfer these skills to the home environment with support from a tailored DVD program and telephone prompting.
Chapter 3: Method

Context

In 2006 the Victoria Special Olympics chapter was informed that all of the ten pin bowling lanes in the city were closing in order to make way for new developments. The very popular Special Olympics Victoria Bowling League was displaced and moved to Sidney, which was inconvenient for many of the athletes. In order to provide other convenient options for the athletes, in October 2006 the ‘Athletic Club’ was established. The goals of the Athletic Club were to provide physical activity opportunities for athletes who were not easily accommodated into other sports and to help the athletes acquire the skills to participate successfully in a physical activity setting. Initiated by the principal investigator, the 2007-2008 season included a health-related fitness component to encourage athletes to develop skills to maintain a healthy lifestyle.

Participants

Participants were recruited from the entire cohort of the Special Olympics Athletic Club on a volunteer basis. Three female and one male athletes agreed to participate. All participants were registered with Special Olympics and met the criteria of having an intellectual disability with a deficit in two major elements (2008). The first element is intellectual functioning, which must be within or below an intelligent quotient score of 70-75 or meet the criteria on another accepted measure. The second element is adaptive behaviour that must be impaired in at least two of the following: communication, self-care, home living, social/interpersonal skills, use of community resources, self-direction, functional academics, work, leisure, health or safety. The participants are required to complete a form upon registration for Special Olympics that includes acknowledgement by an agency or professional that the participants meets the required conditions. Support from IQ, behavioural or support scales from a credited individual (physician,
psychologist, etc.) are desired. Written consent, or assent if appropriate, has been provided by all participants. Caregivers or guardians have signed the consent forms when appropriate to ensure the best interest of the participants.

**Materials**

*Support Intensity Scale (Thompson et al., 2004).*

An intellectual disability is defined as an impairment of intellectual and adaptive behaviour and a deficit in abstract thinking, concept formation, problem solving, and evaluative activity (American Association on Mental Retardation, 2002). The Supports Intensity Scale (SIS) (Thompson et al., 2004) is a tool developed to measure the intensity of support needed for individuals with an intellectual disability based on individual abilities and not limitations. It measures a person’s level of support needs with regards to: home living activities, community living activities, lifelong learning activities, employment activities, health and safety activities and social activities. Raw scores are converted into standard scores and percentiles to identify the individuals place compared to a standardization sample. The SIS standard score is the sum of the standard scores from all of the subscales and represents a general indication of the amount and intensity of the support needed. The higher the reported standard scores and percentiles the greater the amount of support needed. The SIS helps organizations, caregivers, and teams enable people with an intellectual disability to participate successfully in a variety of activities and environments by providing appropriate levels of support (Thompson et al., 2004). The SIS has adequate reliability with regards to internal consistency (> .90) as an assessment scale. The test-retest ($r = .52-.82$) and inter-rater reliability ($r = .36-.79$) was found to be mixed, but acceptable as an assessment tool for planning purposes. Inter-rater reliability was high with all coefficients
being greater than .997. Validation studies have also been completed on the scale (Thompson et al., 2004).

**Self-efficacy Questionnaire (Marks et al., 2001) (Appendix B).**

The self-efficacy of participants was measured using the self-efficacy questionnaire developed by Marks and colleagues (2001) for people with an intellectual disability for their Exercise and Nutrition Health Education Curriculum for people with Developmental Disabilities (Marks et al., 2001). It specifically examines the person’s current self-efficacy with regards to their ability to successfully complete a task and their confidence in completing cardiovascular and strength exercises. Tests for validity and reliability were conducted (Marks et al., 2001); test-retest correlation was 0.52 ($p < .01$).

**Preliminary Strength Questionnaire (Heller et al., 2004) (Appendix C).**

The preliminary strength questionnaire adapted from Heller et al. (2004) was delivered as an open-ended interview to explore participant’s current physical activity and exercise participation, and to record their level of familiarity with exercise bands.

**Physical Activity Readiness Questionnaire (Health Canada, 2007) (Appendix D).**

The Health Canada PAR-Q was administered to participants with care-provider assistance as appropriate. For the majority of people physical activity provides benefits and not hazards. The PAR-Q was used to determine if any of the participants should seek medical clearance before participating in the physical activity program. One of the participants reported having high blood pressure, but after follow up it was found that her blood pressure was controlled with medication and her doctor encouraged participation in exercise. Another participant reported having infrequent mild seizures, again after follow up with caregivers she was cleared for participation.
Satisfaction Questionnaire (Appendix E).

The satisfaction questionnaire was delivered as an open ended questionnaire to identify the aspects of the face-to-face and at-home program that participants liked and did not like. The questions were broad, followed by prompts to discuss specific aspects of the program.

Physical Activity Logs (Appendix F).

Similar to Frey et al. (2005) this study used physical activity logs. The participants logged their planned exercise and their actual exercise during the 9-week intervention program. Once a week the participants recorded which sections of the program they intended to complete and on which days. Their actual level and day of activity was recorded as it was completed.

Skills Check List (Appendix G).

The skills check list is based on a procedural task analysis, where each individual step has a necessary relationship with the other steps in order to produce the final skill (Siedentop, 1991). Six checklists were developed, one for each strength skill (biceps curl, triceps extensions, pull downs, side leg raises, back leg raises and leg extensions). Each check list was made up of the movements required to complete a given skill and was used to determine a participant’s skill level. Each check list falls in sequential order of the appropriate steps.

Take Home Exercise DVD’s (see back cover sheet for copy of DVD).

Similar to Stanish and colleagues (2001) aerobic dance study, exercise DVD’s were used as a medium for instruction. The DVD included strength and cardiovascular sections that mirrored the exercises taught at Special Olympics. The athletes were able to select the section they wished to complete, by clicking on an icon. The cardiovascular section of the DVD included an aerobic workout routine, with increasing levels of duration (3 minutes, 6 minutes, and 9 minutes). The strength section consisted of six exercises, using exercise bands: biceps curl,
triceps extensions, pull downs, side leg raises, back leg raises and leg extensions. Each section included music and encouragement from the instructor.

*The PAD Model.*

Van der Ploeg and colleagues (Van der Ploeg et al., 2004) PAD model was used to inform the development of the program. This program addressed both environmental and personal factors. When looking at the model’s description of environmental facilitators and barriers, this program addressed barriers such as lack of equipment and support and partially addressed the issue of transportation. First the participants were given all the materials and equipment (DVD, DVD player, exercise bands, and log book) necessary to participate in the at home component of the program. Also the barrier of transportation was minimized by making part of the program available in their homes. The program was also designed to provide the participants with the skills and resources necessary to participate in the at-home part of the program without the aid of the care-givers. This design feature aimed to reduce the reported barrier of lack of care-giver time and support. The program also included social support through the coaches at the face-to-face component of the program and through telephone calls on the days the participants planned to exercise. Personal factors addressed via the program’s design included money, self-efficacy, and intention. The participants’ intentions were documented and implemented using the log books, where participants marked down which days they intended to exercise. Participants’ motivation was also taken into account. Although motivation was not directly examined or manipulated, it was taken into consideration when considering activities. Research has identified aerobics and strength training as enjoyed and effective activities (Stanish & Draheim, 2005; Temple, 2007) and therefore were used in the program design. Self-efficacy was identified in the model as a personal factor that can directly influence physical activity
functioning or indirectly influence through intention. Because other research has identified self-efficacy as a primary determinant of physical activity behaviour and exercise, it was a dependent variable in this study.

Design

A multiple case-study design was used (Yin, 1989). This design was chosen because this was an explanatory and an exploratory research endeavor. Similar to the design used by Heller et al. (2004), the participants acted as their own controls and baselines for, self-efficacy and current physical activity levels were established, using interviews and surveys. After baselines were established the participants were introduced to the nine-week exercise program where their skill development and ability to adhere to a physical activity program was recorded. A post-test for self-efficacy was conducted after the termination of the program.

Procedures

Ethics approval was obtained from the University of Victoria Human Research Ethics Committee. The participants were recruited by a third party from the Victoria Special Olympics Athletic Club. The primary investigator held two information and recruitment meetings during a scheduled Special Olympics Event. Athletes that could not attend the meetings were contacted by telephone. Athletes and caregivers received information and consultation regarding the projects purpose, intent, outline, and potential personal benefits.

The program.

The exercise program consisted of face-to-face activity sessions and a home-based exercise program. During the face-to-face activity sessions the participants and coaches (research assistants and trained Special Olympics volunteer coaches) met once a week for 90 minutes at the Victor Broudeur School gymnasium in Victoria, BC. Each 90 minute session was divided
into: a 10-15 minute dynamic aerobic warm up routine, 30 minutes of strength skills, 20-30 minutes of a recreational game or sport activity, 10 minutes cool down and 5-10 minutes for planning and discussion of log books. Athletes who were not enrolled in the study continued to stretch, while planning took place.

The strength skills were taught and monitored throughout the program. There were a total of six exercise band strength exercises: biceps curl, triceps extensions, side leg raises, back leg raises, pull downs, and leg extensions. The skills were introduced progressively over the first six weeks of the program with one skill being introduced each program night. The mastery of each skill was measured using a skill analysis checklist. Participants were only tested on one new skill each program night to avoid overwhelming them. The checklists were executed using a system of least prompts with a 5 second time delay, similar to Zhang et al. (2004). The participants were given a verbal cue to start the skill, followed by a 5-second time delay by the observer and then a more specific cue. If the participant did not complete the step successfully they were stopped and given another verbal cue, followed by a visual cue and then a physical cue following the system of least prompts (Dunn, Morehouse, & Fredericks, 1986). Each cue was executed 5 seconds apart allowing the participant the chance to complete the skill component with the least amount of help. The raters identified if the participants completed each step: successfully, successfully with assistance (verbal, visual or physical), or unsuccessfully. Once the athletes could successfully complete a skill with no more than visual prompt during the testing, the skill was added to their take home exercise regime. No more than visual prompting was selected as the inclusion criteria as participants would receive the visual and verbal prompting via the DVD at home, but they could not be physically assisted. During the weekly sessions the participants planned and
recorded the two additional days and the exercises that they intended to complete from the interactive DVD.

For the at-home component the researcher met with all participants in their homes to familiarize them with the DVD and the exercise bands and to ensure they had a sufficient space to exercise in. Athletes who did not have their own DVD players were issued a portable one, to make exercising convenient. The participants were contacted by the researcher on the days they planned to exercise to verify if they have completed their exercise goal and any concerns they had. If participants had not completed their exercise goal, the researcher prompted the behaviour using the prompting schedule (see Appendix H). Post tests were conducted after the termination of the intervention program, for self efficacy, current activity, and program satisfaction.

Data Analysis

Initial analysis included visual inspection of the results for skill mastery and program adherence. The completed skill analysis checklists were converted into percentages with regards to the components completed with no prompting divided by the total possible components. The percentages were then organized by week and a frequency count was used to determine mastery and overall trends. Mastery was reached when the participant completed a skill three consecutive sessions with no prompting (a score of 100%). The number of prompts for each skill for each week were also organized and examined to identify any consistent trends. The percent of the total number of prompts needed each week with regards to the total number of components tested (including all skills) was graphed and examined for patterns. Examination of the log books and records from the telephone prompting determined the number of completed versus planned exercise days. Visual inspection was chosen because in the applied setting the desirable effects
of an intervention program are large and should be obvious through visual analysis (Kazdin, 1982).

    Descriptive statistics were computed on self-efficacy. Dependent t-tests were performed to statistically analyze the group means of the pre and post tests for self-efficacy. The t-tests were analyzed using the Statistical Package for Social Sciences (SPSS Inc., 2003).
Participant 1 was a 30 year old female with a standard SIS score of 43%. She was in the 25th percentile for community living activities, lifelong learning activities, and social activities; the 16th percentile for home living activities; and the 9th percentile for employment activities and health and safety activities. She had a face-to-face program adherence of eight days out of nine (88.9%). Participant 1 was introduced to and tested on six of the strength skills by week eight of the intervention (see Table 1). She did not reach mastery for any of the skills. Yet for three of the skills (biceps curls, side leg raises and pull downs) visual inspection showed a positive increase in the percent of completed components that required no prompting. Two of the skills (back leg raises and leg extensions) remained fairly consistent at a high percentage of skill components being completed without prompting. Analysis of the components of triceps extensions showed an inconsistent and variable pattern (see Table 2). For triceps extensions participant 1 had consistent difficulty with placing the hand on the opposite shoulder and bending her elbow during execution of the exercise. A count of the total number of skill components mastered each week revealed that even as the number of possible skill components increased, participant 1 showed a decrease in the level of support needed to complete each step (see Figure 1). Figure 1 also illustrates that participant 1 was able to complete a greater percent of total components with no assistance as the weeks progressed. By week eight all six skills were tested and completed with a maximum of visual prompting (see Table 3), and no physical assistance was needed.
Table 1 Week Each Skill was Introduced and Tested for Participant 1

<table>
<thead>
<tr>
<th>Skill</th>
<th>WeekIntroduced</th>
<th>First Week Tested</th>
<th>Total number of times tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps Curls</td>
<td>2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Triceps Extensions</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Side Leg Raises</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Back Leg Raises</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Pull Downs</td>
<td>7</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Leg Extensions</td>
<td>7</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2 Percent of Strength Skills Completed with No Prompts Over a 9-week Exercise Intervention for Participant 1

<table>
<thead>
<tr>
<th>Week</th>
<th>Biceps Curl</th>
<th>Triceps Extensions</th>
<th>Side Leg Raises</th>
<th>Back Leg Raises</th>
<th>Pull Downs</th>
<th>Leg Extensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>22</td>
<td>29</td>
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<td>7</td>
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<td>100</td>
<td>100</td>
<td>86</td>
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<td>89</td>
<td>53</td>
<td>92</td>
<td>93</td>
<td>100</td>
<td>80</td>
</tr>
</tbody>
</table>

*Note. * indicates that mastery has been reached.

Table 3 Number of Prompts Needed for Strength Skills for Participant 1

<table>
<thead>
<tr>
<th>Week</th>
<th>Biceps Curl</th>
<th>Triceps Extensions</th>
<th>Side Leg Raises</th>
<th>Back Leg Raises</th>
<th>Pull Downs</th>
<th>Leg Extensions</th>
</tr>
</thead>
<tbody>
<tr>
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<td>P</td>
<td>V</td>
<td>R</td>
<td>P</td>
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<td>0</td>
<td>8</td>
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<td>0</td>
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</tr>
<tr>
<td>9</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note. V=Visual Prompts, R= Verbal Prompts, and P=Physical Prompts. Shading: Black = absent or skill not introduced, Grey = identifies completion with a maximum of visual or verbal prompting, and White = physical assistance required.*
Figure 1 Type of assistance needed for total skills mastered each week for participant 1 as percentage of components tested

After participant 1 was able to successfully complete a strength skill without physical prompting during the face-to-face program it was added to her at-home program, and she reported completing the planned at-home exercises in her log book. By the end of the eighth week she had added all of the six exercises to her at-home program. Log book records revealed that participant 1 completed 17 of the 18 (94%) possible planned at-home exercise days. Participant 1’s self-efficacy score was 10.5 at pre-test and 13 at post-test.

Participant 1 was satisfied with the face-to-face program except she did not enjoy playing floor hockey. She enjoyed the music for aerobics, using the exercise bands and planning sessions. She found the DVD easy to use and reported completing the at-home component in her
own apartment with out any other assistance. She found the telephone prompting helpful for
reminding her to exercise.

Participant 2

Participant 2 was a 25 year old male with a standard SIS score of 34%. He scored in the 5th
percentile for home living activities, community living activities, employment activities, and
social activities. He scored in the 16th percentile for lifelong learning activities and health and
safety activities. Participant 2 was introduced to and tested to all six strength skills by week
seven (see Table 4). Participant 2 reached mastery on three of the six strength skills (biceps curls,
triceps extensions and back leg raises) (see Table 5). For side raises participant 2 was tested on
the skill 6 times and completed the skill with none or few prompts each times, yet he did not
reach mastery because he did not complete the skill with no prompts on three consecutive
occasions. In weeks 6 and 8 participant 2 needed a verbal cue to place the band around both
ankles. He also had difficulty with pull downs on the same days. He needed physical and visual
prompting to keep his elbows bent as muscles were contracted and to complete the required
repetitions. Participant 2 had a consistent score of 90% for all three days leg extensions were
tested. On two days he needed verbal cues to complete the number of repetitions and on the other
day he needed one verbal cue to bring his leg fully into extension. Figure 2 illustrates that
participant 2 was able to master a high percentage of skill components with no prompting even
as the number of potential components increased. Participant 2 completed all six skills with a
maximum of visual prompting by the 7th week of the face-to-face program (see Table 6). During
the 9th week of testing only one verbal prompt was required for completion of all six strength
skills.
Table 4: Week that Each Skill was Introduced and Tested for Participant 2

<table>
<thead>
<tr>
<th>Skill</th>
<th>Day Introduced</th>
<th>First Day Tested</th>
<th>Total number of times tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps Curls</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Triceps Extensions</td>
<td>3</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Side Leg Raises</td>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Back Leg Raises</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Pull Downs</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Leg Extensions</td>
<td>7</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 5: Percent of Strength Skills Completed with No Prompts Over a 9-week Exercise Intervention for Participant 2

<table>
<thead>
<tr>
<th>Week</th>
<th>Biceps Curl</th>
<th>Triceps Extensions</th>
<th>Side Leg Raises</th>
<th>Back Leg Raises</th>
<th>Pull Downs</th>
<th>Leg Extensions</th>
</tr>
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<tbody>
<tr>
<td>2</td>
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<td>100</td>
<td>100*</td>
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<td>100</td>
<td>92</td>
<td>100</td>
<td>57</td>
<td>90</td>
</tr>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>90</td>
</tr>
</tbody>
</table>

Note. * indicates that mastery has been reached.

Table 6: Number of Prompts Needed for Strength Skills for Participant 2

<table>
<thead>
<tr>
<th>Week</th>
<th>Biceps Curl</th>
<th>Triceps Extensions</th>
<th>Side Leg Raises</th>
<th>Back Leg Raises</th>
<th>Pull Downs</th>
<th>Leg Extensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prompts</td>
<td>V</td>
<td>R</td>
<td>P</td>
<td>V</td>
<td>R</td>
<td>P</td>
</tr>
<tr>
<td>2</td>
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<td>0</td>
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</tr>
<tr>
<td>8</td>
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<td>0</td>
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<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note. V = Visual Prompts, R = Verbal Prompts, and P = Physical Prompts. Shading: Black = absent or skill not introduced, Grey = identifies completion with a maximum of visual or verbal prompting, and White = physical assistance required.
Examination of participant 2’s exercise log book showed he completed 94% of the planned at-home exercise sessions. Participant 2’s self-efficacy scores at pre-test and post-test were 13.5 and 14.0, respectively. Participant 2 reported being satisfied with all aspects of the program. He enjoyed the music during aerobics, and reported that he liked to use the exercise bands over weights. He specifically liked the biceps curl because it “made him strong”. Participant 2 indicated that the planning of the at-home exercises and the telephone prompts reminded him to exercise. He reported that during the at-home component the DVD was easy to use and he was able to use it on his own with no assistance.
Participant 3

Participant 3 was a 38 year old female with a standard SIS score of 49%. She was in the 63rd percentile for lifelong learning activities; the 50th percentile for employment activities; the 25th percentile for social activities; the 16th percentile for home and community living activities; and the 9th percentile for the health and safety activities. Participant 3 had program adherence for five (55%) of the face-to-face program nights. Participant 3 was the least consistent attendee to the face-to-face program component. She was introduced to all six skills and tested on four of the skills by week eight (see Table 7). She reached mastery for biceps curls (see Table 8). For both side and back leg raises participant 3 was not tested enough times to determine whether she could meet the mastery criteria. However, she only needed minimal prompting during the testing she did partake in. For side raises she needed one visual cue when it was first tested to place band around both ankles and she needed one visual cue for back raises to bring the leg into the start position. She was only analyzed once for back leg raises so the trend of skill acquisition and her skill mastery was not possible. Her level of success and acquisition for triceps extensions was inconsistent on the three days it was analyzed with the most amounts of physical assistance being required for the last day of skill testing (see Table 9). With regards to triceps extensions participant 3 had difficulty placing her hand on the opposite shoulder, placing both hands in the start position, extending and contracting her elbow during execution and switching sides. Visual inspection of the percentage of assistance needed for each skill component taking into consideration all potential skill components each week, participant 3 showed an inconsistent pattern of assistance needed (Figure 3). The last week of testing which included the highest number of potential skill components required the greatest amount of physical support.
### Table 7 Week that Each Skill was Introduced and Tested for Participant 3

<table>
<thead>
<tr>
<th>Skill</th>
<th>Day Introduced</th>
<th>First Day Tested</th>
<th>Total number of times tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps Curl</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Triceps Extensions</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Side Leg Raises</td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Back Leg Raises</td>
<td>5</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Pull Downs</td>
<td>6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Leg Extensions</td>
<td>8</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Table 8 Percent of Strength Skills Completed with No Prompts over a 9-week Exercise Intervention for Participant 3

<table>
<thead>
<tr>
<th>Week</th>
<th>Biceps Curl</th>
<th>Triceps Extensions</th>
<th>Side Leg Raises</th>
<th>Back Leg Raises</th>
<th>Pull Downs</th>
<th>Leg Extensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
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<tr>
<td>6</td>
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<td>100*</td>
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<td>92</td>
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<td>7</td>
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<td></td>
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<tr>
<td>8</td>
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<td>18</td>
<td>100</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>9</td>
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<td></td>
</tr>
</tbody>
</table>

*Note.* * indicates that mastery has been reached.

### Table 9 Number of Prompts Needed for Strength Skills for Participant 3

<table>
<thead>
<tr>
<th>Week</th>
<th>Biceps Curl</th>
<th>Triceps Extensions</th>
<th>Side Leg Raises</th>
<th>Back Leg Raises</th>
<th>Pull Downs</th>
<th>Leg Extensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
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<td></td>
<td></td>
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<tr>
<td>9</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* V=Visual Prompts, R= Verbal Prompts, and P=Physical Prompts. Shading: Black = absent or skill not introduced, Grey = identifies completion with a maximum of visual or verbal prompting, and White = physical assistance required.
Participant 3 reported having difficulty completing the strength skills that were added to the at-home exercise component. The difficulty related to the medium of delivery (the DVD) and not with the specific skills. She was unable to navigate though the DVD menu because her remote control was out of batteries. She had difficulty communicating with the researchers the problem that she was having and was unable to access support at home for this issue. During the 5th week the problem was addressed and the participant was provided with a portable DVD player that did not require a remote control. After the new DVD player was set up the participant reported completing the planned strength and aerobic exercises. Although she did not complete all of the exercises indicated in the exercise regimes, she did complete aerobic exercise on 100% of the days that she planned to exercise. Participant 3 showed no change in her level of self-efficacy from pre to post test, both tests had self-efficacy scores of 13.
Participant 3 reported being satisfied with the aerobic exercises, the games and the planning exercises during the face-to-face program. She reported that she “did not really like using the exercise bands for strength.” With regards to the at-home component, participant 3 found it easy to access the 3-minute aerobic program, but had difficulty accessing the extended aerobic exercises and strength exercises. She reported using the DVD on her own with no help from others. She found the telephone prompting to be helpful in reminding her to exercise.

Participant 4

Participant 4 was a 30 year old female with a standard SIS score of 47%. She scored in the 37th percentile for lifelong learning, and health and safety activities; the 25th percentile for employment and social activities; the 16th percentile for home living activities and the 9th percentile for community living activities. She had program adherence for six of the nine (67%) face-to-face program nights. She was introduced to all six strength skills by week seven and tested on all six strength skills by week nine (see Table 10).

Participant 4 reached mastery for biceps curl (see Table 11). Visual inspection of the percentage of components completed without prompting suggested that participant 4 showed a positive trend of improvement for back leg raises, and triceps extensions. Participant 4 had difficulty with triceps extensions and required two physical prompts for each of the first four days of testing. She specifically had difficulty putting her hands in the correct positions with one hand on the opposite shoulder and the other grasping the band at the hip. She also needed visual and verbal prompting for extending the arm at the elbow for the four initial tests. By the fourth week of testing for this skill she was able to complete the skills with verbal prompting for the components she found difficult. Participant 4 had a consistent pattern of improvement with side raises from the initial day of testing for the skill. During the first day she required a visual cue to
place the band around her ankles and verbal cues for holding onto the chair, bringing the leg to the side until tension is reached and changing sides. During the last three days of testing for side raises participant 4 required less prompting then the first day. The prompting she required for the last three days of testing are as follows; day 2 no prompts; day 3 one verbal cue to hold onto the chair; and day 4 one verbal cue to hold onto the chair and one verbal cue to switch sides. Participant 4 also showed a need for less prompts for back raises during the three days it was tested (weeks 7-9). During week 7 she required verbal prompts to hold onto the chair and place the band around both ankles; and she required physical prompts to stand shoulder width apart. Participant 4 did not require any prompts for back raises during week 8 and only required one verbal prompt to slowly bring leg back until band tension is reached. Participant 4 was not tested on pull downs and leg extensions enough times to establish mastery, yet she only required a verbal cue to place both hands on the band and to slowly bring arms back into start position for pull downs; and a verbal cue to complete the number of repetitions required for leg extensions. She had a variable pattern of success for side leg raises and she had a consistent score for the two days of testing for the pull downs. Participant 4 was only tested on leg extensions once, so its level of sustainability and mastery was not established.

Examination of Figure 4 illustrates that as more skill components were introduced participant 4’s level of prompts needed continued to decrease. The percent of physical assistance decreased with no physical assistance required during week nine when all six strength exercises were tested. Participant 4 had completed all 6 skills with a minimum of visual inspection by the 9th week of the program.
### Table 10 Week that Each Skill was Introduced and Tested for Participant 4

<table>
<thead>
<tr>
<th>Skill</th>
<th>Day Introduced</th>
<th>First Day Tested</th>
<th>Total number of times tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps Curl</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Triceps Extensions</td>
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<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Side Leg Raises</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Back Leg Raises</td>
<td>5</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Pull Downs</td>
<td>7</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Leg Extensions</td>
<td>7</td>
<td>9</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 11 Percent of Strength Skills Completed with No Prompts Over a 9-week Exercise Intervention for Participant 4

<table>
<thead>
<tr>
<th>Week</th>
<th>Biceps Curl</th>
<th>Triceps Extensions</th>
<th>Side Leg Raises</th>
<th>Back Leg Raises</th>
<th>Pull Downs</th>
<th>Leg Extensions</th>
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<td>85</td>
<td>93</td>
<td>86</td>
<td>90</td>
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</tbody>
</table>

*Note.* * indicates that mastery has been reached.

### Table 12 Number of Prompts Needed for Strength Skills for Participant 4

<table>
<thead>
<tr>
<th>Week</th>
<th>Biceps Curl</th>
<th>Triceps Extensions</th>
<th>Side Leg Raises</th>
<th>Back Leg Raises</th>
<th>Pull Downs</th>
<th>Leg Extensions</th>
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<td>1</td>
<td>2</td>
</tr>
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<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note.* V=Visual Prompts, R= Verbal Prompts, and P=Physical Prompts. Shading: Black = absent or skill not introduced, Grey = identifies completion with a maximum of visual or verbal prompting, and White = physical assistance required.
Participant 4 reported completing the exercise skills at home 4 of the 18 (28%) planned exercise days. Her self-efficacy at pre-test was 11.5 and 13.0 at post-test. Participant 4 reported being satisfied with both the face-to-face and the at-home program. She enjoyed the music, the strength exercises, the games, and the planning exercises. She reported finding the DVD at-home easy to use and she was able to use it on her own without assistance. She also found the telephone prompting helpful and said that the DVD player was the best part of the program.

*Group Self-efficacy*

A dependent t-test was performed to analyze the self-efficacy at a group level. Results revealed that self-efficacy toward exercise did not significantly increase from pre-test ($M = 12.1$) to post-test ($M = 13.3$) $t(3) = 2.03$, $p = .14$
Chapter 5: Discussion

This study demonstrates that individuals with an intellectual disability can acquire new physical activity skills through face-to-face delivery in a relatively short period of time. It also provides support that this population can plan to use and apply these skills in the home environment with the support from an exercise DVD and telephone prompting. In general, the participants were satisfied with the delivery and design of the face-to-face and the at-home components of the exercise programs.

Consistent with previous research (King & Mace, 1990; Pitetti & Tan, 1991; Zhang et al., 2004) this study demonstrated that people with an intellectual disability could acquire exercise skills and exercise consistently with appropriate levels of support and assistance. Although the majority of participants did not reach mastery of the skills, by the end of the 9-weeks all of the participants were able to complete the tested skills with no more than a visual prompt. Being able to complete skills with no more than a visual prompt is important because it allows participants to follow either a leader led exercise program or an exercise DVD because both of the mediums of instruction include visual and verbal prompting in their delivery. By being able to complete the skill during face-to-face interaction they are more likely to be able to complete the same skill with a DVD. Stanish and colleagues (2001) found no significant difference in improvement in moderate-vigorous physical activity levels for 17 people with an intellectual disability when instructed via a leader-led or a video-led dance program. This suggests that the two mediums of instruction had similar levels of effectiveness. The results of the current study showed that three of the four participants were tested on all six strength skills and by week nine all three were able to acquire all the skills with no more than visual prompting. Acquisition of strength skills for participant 3 was only evaluated for four of the skills. As the program was designed to tailor the
introduction of new skills based on the participant’s prior level of success, this participant was not introduce to all of the skills due to absences from the face-to-face program. Notwithstanding her absences, she was able to complete all four skills introduced with no more than visual prompting.

Participants 2, 3, and 4 reached mastery on the biceps curl, participant 2 also mastered the triceps extensions and back leg raises, and participant 1 did not master any of the skills. The biceps curls were the easiest of the skills, with the least amount of skill components. It was also the first skill taught and received the most testing and days of practice. This could explain why the biceps curl was the most prominent skill mastered. The other skills were more difficult, and may have needed additional assessment and instructional days to reach mastery. In general visual inspection showed an improvement in skill completion for most of the skills tested for most of the participants, with triceps having the most variability.

The triceps extension was the most difficult skill taught; it had the most number of skill components and appeared conceptually difficult. Although this skill was introduced second and was tested multiple times for each participant it appeared to require multiple days of instruction and practice. For participants 2 and 4 skill completion of triceps extensions with no more than visual prompting required multiple testing sessions and face-to-face practice. As well participant 2 required 7 days of testing before reaching mastery, which was more days then he required for the other two skills he mastered. For participant 3 the skill was added to the home program one week and removed the second week because of an inability to complete the skill without physical assistance. In hindsight, it may have been advisable to wait until mastery was attained (that is, three consecutive weeks with all skill components demonstrated) before skills were added to the
at-home program. Additional research is needed to depict the most effective number of successful attempts needed to be sustained before adding to the at-home program.

In general, the participants in the current study required a lower number and lesser intensity of prompts for the completion of strength skill components tested as the program progressed - even as the total number of components tested increased. When examining the four graphs (Figures 1, 2, 3 and 4) of the percent of prompts needed in relation to the total number of components tested; all of the participants showed a decrease in the amount of prompting needed for successful completion of the strength skill components, with the exception of the 2nd week of testing. This may be attributed to the introduction of the triceps extension in the second week of testing, which was previously identified as the most difficult strength skill. With the exception of the second week of testing, as the number of tested components increased across the weeks the participants needed less prompting. Findings from Zhang and colleagues (2004) and King and Mace (1990) found that using a system of least prompts was effective for acquisition of physical activity skills for people with an intellectual disability. Using a system of least prompts, Zhang and colleagues found that an individual with a severe intellectual disability can acquire the correct responses needed for a recreational bowling skill. Zhang was able to completely fade out prompts, but they only examined one skill and the participant had 32 training session. King and Mace used a system of least prompts to teach an aerobic exercise program to three adults with an intellectual disability, similar to the current study their participants did not reach 100% mastery for all of the skill components, but the participants were able to acquire the skills more effectively and with less prompts. In the current study the only exception for a decrease in required prompting was participant 3 who required the most amount of physical prompting.
during the last week her skill level was assessed. Participant 3 was absent the day prior to the last assessment day, which may explain the regression in prompting required.

No other study has specifically examined the acquisition of specific strength skills, so the findings of this study enhance the current evidence that people with an intellectual disability can acquire physical activity skills. These findings show that people with an intellectual disability can learn multiple exercise skills and can acquire these skills with limited amounts of support. As stated previously people with an intellectual disability are at risk for obesity (Rimmer & Yamaki, 2006), cardiovascular disease (Draheim, 2006), osteoporosis (Felix et al., 1998), and type II diabetes (Draheim, McCubbin et al., 2002). These risk factors have been linked to inactivity (Health Canada, 2007) and the majority of people with an intellectual disability do not meet recommended levels of physical activity or exercise (Stanish et al., 2006). These findings suggest that people with an intellectual disability can acquire exercise skills and adhere to exercise programs, yet further research is needed to investigate if people with an intellectual disability can complete the exercise skills at an intensity and duration that will cause improvements in health.

The current research study attempted to have participants transfer the skills learnt in the face-to-face program to their homes, thereby reducing several barriers to regular exercise. The PAD model was used to conceptualize the design of the study, by addressing environmental and personal factors including: environmental facilitators (transportation, equipment), social influence (coaches and researcher), personal facilitators (money) and self-efficacy. This study was able to create opportunities for participation in exercise for people with intellectual disabilities by decreasing some of the primary barriers. Resources and equipment were provided for the participants and they were taught to use the equipment without the help of their
caregivers. All of the participants reported using the DVD on their own without the assistance of others, suggesting first that this is a feasible approach and medium for exercise interventions and secondly it could be viable and worthwhile for caregivers and other staff members to consider when considering exercise options. There is a need for more research into programs that can be obtained and delivered without caregiver assistance.

Another prevalent barrier to exercise among adults with intellectual disability is transportation. Many people with intellectual disabilities report that they are unable to exercise because they have to rely on others to transport them to the activities (Temple & Walkley, 2007). This program was designed to foster two additional days of exercise at home, therefore reducing the necessity for transportation on those days. On the whole, this approach appeared effective. Participant 3 completed 100% of the planned at-home exercise sessions, participant 1 and 2 completed 94% and participant 4 completed 28%. Participant 4 was often difficult to contact by telephone and she often forgot to bring her log book to the program and forgot to fill it out at home. The 28% of the completed exercises is a report of the recorded adherence to the at-home program, which may be limited in its accuracy. These considerations may explain her low level of at-home adherence. In general, the findings from the current research project suggest that individuals with an intellectual disability can participate in exercise in their homes. The majority of the participants indicated that they enjoyed using a DVD to exercise with and they found the DVD easy to use. By encouraging people with an intellectual disability to participate in exercise programs that they can do independently in their home will minimize the barriers that exist due to caregiver constraints such as a lack of time and transportation.

Some barriers arose in this project that were not anticipated. Participant 3 had problems navigating the DVD because her remote control was out of batteries. After three weeks of trying
to follow up with the participant the problem was finally identified. The participant’s inability to accurately and efficiently identify and recruit assistance with regards to the lack of batteries presented a barrier to participation in the strength exercises. The issue was eventually resolved by providing a portable DVD player that did not require a remote control. However this difficulty should be addressed in future research by either 1) educating participants on when or how to communicate problems and concerns or 2) by consideration of simpler tailored forms of delivery. Other exercise programs have provided a session to educate participants not only how to use equipment but when to acquire outside assistance which may open communication between the participant and the research with regards to such issues (Heller et al., 2004). As well the specific weekly programs could be delivered by individualized DVDs that run through the assigned exercise regime without stopping. A research project could also make use of the internet and have the assigned exercise regimes emailed or web-streamed to participants. By providing specific individualized exercise programs by DVD or via the internet would decrease the need for navigation through the DVD, which has been identified as a difficulty for some participants. The individualized delivery of the exercise program would be able to further tailor the needs and abilities of the participants, by dictating the intensity and duration of the program as well as the specific skills introduced.

Although this study provides support that exercise skills may be able to be transferred to new environments and not just new situations, the participants’ quality and level of transfer was determined by self-report which is subjective and relies on participant’s recollection and candor. Future research needs to use objective measures to see if they actually do the exercises at home including observation or accelerometry. This research project specifically examined the skill
acquisition and transfer yet additional research that includes measuring outcomes such as cardiovascular fitness and strength would be valuable.

The results of this study show that some people with an intellectual disability can plan and adhere to an at-home exercise program. Three of the participants reported completing 94% or better of the planned exercises. The other participant (participant 4), who only completed 28% of the planned exercises, was absent for one-third of the face-to-face program and she forgot to bring her log book 4 times to the face-to-face program and her planned days were recorded on separate pieces of paper which could be easily misplaced. Also, this participant was very difficult to reach by telephone to prompt the behaviour. Often, the principal investigator did not speak to participant 4 directly and left messages on the answering machine. The participant may not have received the messages or a message may not be as effective at prompting behaviour as having actual contact, as it is a less direct form of social support. Research has shown that social support is a primary determinant of participation in exercise for people with an intellectual disability (Messent et al., 1999; Temple & Walkley, 2007) so the lack of direct support may have influenced the participants’ behaviour. All of the participants in the study reported that telephone prompting was a useful tool to help remind them to exercise, therefore not directly speaking to the participant may have been a disadvantage.

In contrast to participant 4, participant 2 asked on two additional weeks to exercise three and four times per week, while participant 3 reported participating at least one additional day every week during the program. These findings provide support that individuals with an intellectual disability can be motivated to participate in exercise programs which is often contrary to past research that has found adults with an intellectual disability lack motivation to participate in physical activity (Rimmer, 1996). Prasher and Janicki (2002) state that a lack of
motivation is a major concern when trying to promote physical activity to improve health conditions and behaviour. Other researchers (Pitetti, Rimmer, & Fernhall, 1993) have suggested that if people with intellectual disability were aware of the relationship between physical activity and health, most are unlikely to have either the capacity or resources to alter their lifestyle without the assistance of others. Although the at-home exercise regimes may not meet current recommended levels of exercise for health benefits, the participants desire to exercise more than assigned provides support that exercise at a greater duration, frequency, and intensity may be possible. This study illustrated that with the proper level of support and resources people with an intellectual disability can plan and complete an exercise regime in their home. Future research to investigate if individuals with an intellectual disability can plan and complete exercise at a duration and frequency that meets recommended levels of exercise for health benefits, would be worthwhile.

Research has found that self-efficacy is the primary psychosocial determinant of exercise behaviour (Bandura, 1997). Yet this study found with the increase in at-home exercise there was no significant improvement in self-efficacy. This may be explained by a ceiling effect and because of the small sample size. During the pre-test the participants already had high levels of self efficacy, scores between 10.5-13 out of 15. All the participants reported being active in at least one other Special Olympics activity and they had all voluntarily signed up for athletic club. The research suggests that if they are already participating in the behaviour then they are likely to have a positive self-efficacy toward that behaviour. Research with a more sedentary group of participants would likely show an increase in self-efficacy, as research suggests that self-efficacy plays a greater role in the adoption of exercise than the maintenance of exercise (Oman & King, 1998).
In general participants were satisfied with the aerobic and strength program, this was consistent with previous research that suggested that people with intellectual disabilities enjoy aerobic dance and strength training (Stanish et al., 2001; Temple, 2007). The participants said they enjoyed the use of music for exercise, as well as the exercise planning sessions. Three of the participants reported enjoying using the exercise bands for strength exercises. One participant reported a preference for exercise bands over weights. Participant 3 reported not being satisfied with the exercise bands. However, this participant had the most difficulty performing the skills and had the lowest level of face-to-face program adherence.

**Conclusion**

Individuals with an intellectual disability have a high prognosis for cardiovascular disease (Draheim, 2006), type II diabetes (Draheim, McCubbin et al., 2002) and osteoporosis (Felix et al., 1998). They also have high levels of overweight and obesity (Rimmer & Yamaki, 2006) and are likely to have an inactive lifestyle (Temple et al., 2006). Participation in regular exercise has been identified as an effective counter measure to the health issues mentioned above (Health Canada, 2007). Individuals with intellectual disabilities and health care professionals often report perceived barriers that prevent them from participating in exercise that will improve health.

Research has found that individuals with an intellectual disability can acquire physical activity skills (King & Mace, 1990) and adhere to a face-to-face program (Cluphf et al., 2001). Yet individuals with an intellectual disability do not continue to participate in exercise programs after the face-to-face programs have been terminated (Cluphf et al., 2001). This study aimed to address the issue of discontinuation of regular exercise by providing participants with the
resources and skills to participate in an at-home program, as well as to address some of the main barriers identified by individuals with an intellectual disability and healthcare professionals.

The research project was conceptually designed from the PAD model (Van der Ploeg et al., 2004), by addressing environmental barriers including transportation, equipment and social support; social influences including health professionals and athletic coaches; personal facilitators including skills; and self-efficacy. The current study reduced the need for transportation by allocating two days of the exercise program be done in the home, and it removed the inaccessibility of lack of equipment by providing all participants with the equipment they need. The researcher provided social support from coaches during the face-to-face program and telephone prompting during the at-home component. The personal facilitator of skill level was addressed by providing the participants with instruction and testing of the strength skills to encourage mastery and successful development of the skill. The study recorded self-efficacy before and after the program to examine if it increased with the improvement and development of the exercise skills.

In general, the results were supportive for the acquisition and transfer of exercise skills for individuals with an intellectual disability. Three of the participants reached mastery on at least one of the strength skills introduced and the rest of them showed a general trend of improvement from initial testing to the final testing of each skill. As the individual’s skill level increased their level of prompting also reduced. The participant that was the most consistent in terms of face-to-face program adherence and at-home program adherence reported the greatest number of skills mastered, while participants who were less consistent and had lower levels of face-to-face program adherence mastered less skills and required more prompts.
All of the participants adhered to the face-to-face program at least 50% of the time. Three of the participants reported high levels of at-home program adherence with at least 94%. The fourth participant had 28% adherence. All participants were satisfied with most of the program. One participant reported not liking the exercise bands for strength exercises although she was not able to elaborate further. The participants all reported enjoying using music during exercise, planning weekly exercises and playing the games. They all also reported that the DVD was easy to use and that they completed the DVD program without anyone else’s assistance. There was no change in self-efficacy from pre to post test.

There were some limitations to this study. First the program adherence, preliminary strength questionnaire, self-efficacy and program satisfaction relied on the self-report of the participants which is subjective and may not be completely accurate. Second the sample size was small, which decreases the chance of generalization into a broader population. In addition, the length of the Special Olympics term limited the duration of the face-to-face program. Although improvements were seen, most other successful intervention programs averaged about 12-weeks. By increasing the duration of the exercise program the participants may be able to reach mastery for more of the strength skills.

Future research should focus on developing a greater duration and a higher intensity of exercise for people with an intellectual disability in order to meet physical activity requirements to initiate and measure health and functional outcomes. Other research should focus on the maintenance of the at-home exercise program after a follow up point.
References


Appendix A

Physical Activity and Disability Model (Van der Ploeg et al., 2004)

Fig. 3. The Physical Activity for people with a Disability (PAD) model, an integrated model of physical activity behaviour and its relation with functioning and disability. The framework of the International Classification of Functioning, Disability and Health (ICF) model is shown by the white and grey boxes and the solid arrows, while the determinants of physical activity behaviour are shown in the red boxes. The dashed arrows in the PAD model represent the pathway through which these factors determine physical activity, although not all possible pathways and relations are shown in the model. Most of the dashed arrows also work in the opposite direction and, as shown in the general framework, all components of the integrated model more or less interact with each other.
Appendix B

Self Efficacy Questionnaire
(adapted from Marks, Heller & Sisirak, 2001)

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

“Do you think that you can:”

1.) Do exercises to stretch your muscles?
   1 Not sure   2 A little sure   3 Totally sure

2.) Do exercises to make your muscles stronger?
   1 Not sure   2 A little sure   3 Totally sure

3.) Do exercises to make you sweat or breathe hard, such as aerobics, walking or jogging?
   1 Not sure   2 A little sure   3 Totally sure

4.) Do you think that you can follow a video lead exercise program?
   1 Not sure   2 A little sure   3 Totally sure

5.) Do you think you can exercise with exercise bands?
   1 Not sure   2 A little sure   3 Totally sure
Appendix C

Preliminary Strength Questionnaire

1.) What have you done for exercise this week, for example, have you gone for a walk or gone to the gym?

2.) Have you done any exercise this week that made your muscles stronger, for example have you lifted weights?

3.) If so were your muscles sore or tired afterwards?

4.) Have you done any other activities this week that you needed strong muscles for, for example lifting something heavy?

5.) Have you ever used exercise bands before (show exercise band) to do exercises that strengthen your muscles?

6.) If so, which exercises have you done?
Appendix D

Physical Activity Readiness Questionnaire (Health Canada, 2007)

1.) Has your doctor ever said you have heart trouble?
   YES       NO

2.) Do you frequently have pains in your chest?
   YES       NO

3.) Do you often feel faint or have spells of severe dizziness?
   YES       NO

4.) Has your doctor ever said your blood pressure was too high?
   YES       NO

5.) Has your doctor ever told you that you have a bone or joint problem such as arthritis that has been aggravated by exercise, or might be made worse with exercise?
   YES       NO

6.) Is there a good physical reason not mentioned here why you should not follow an activity program even if you want?
   YES       NO

7.) Are you over 65 and not accustomed to vigorous exercise?
   YES       NO
Appendix E

Program Satisfactions

1) Tell me about what you liked or didn’t like about the Special Olympics Athletic Club at Victor Broudeau this season.
   - Prompt: did you like the aerobics to music?
   - Prompt: did you like using the bands for strength?
   - Prompt: did you like the recreational activities?
   - Prompt: did you like planning exercises for the week with a coach?
   - Probe: Explore what the participant did or did not like about each aspect.

2) What would you change about the Athletic Club at Victor Brodeau?

3) Tell me about using the DVD to exercise at home?
   - Prompt: was it easy to use or hard to use the DVD?
   - Prompt: where did you exercise in your home?
   - Prompt: did other people help you?
   - Probe: who helped you? In what way did they help?
   - Prompt: did you like using the DVD to exercise at home?
   - Probe: was it helpful or not helpful to have someone telephone during the week to ask about your exercise? How was it helpful/not helpful?

4) What would you change about the at-home part of the program?
   - Prompt: different activities?

5) What were the best things about the program this year?

6) What didn’t you like about the program this year?

7) Is there anything else you want to tell me about the program or Special Olympics?
Appendix F

Log Book
Exercise Routine
(Complete circled sections)

Aerobics:

Strength:

- Curl
- Tricep
- Pull
- Extend
- Side
- Back
## Activity Log

**Goal:**

<table>
<thead>
<tr>
<th></th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planned</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Completed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Week:_________________  Date:_________________

List Exercises:________________________________________
## Appendix G

### Example of Skill Check list

<table>
<thead>
<tr>
<th>Athletes name:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scorers name:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Exercise:</strong> Biceps Curl</th>
<th><strong>Successful</strong></th>
<th><strong>Successful with verbal cue</strong></th>
<th><strong>Successful with visual cue</strong></th>
<th><strong>Successful with physical cue</strong></th>
<th><strong>Not successful</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pick up exercise band</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hold one end in each hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place both feet on the band</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Move to initial position (standing square with arms beside the body)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slowly bring arm to full contraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slowly bring arm to full extension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slowly bring the other arm to full contraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slowly bring the arm to full extension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed required # of repetitions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# of required repetitions:  
Completed # of repetitions:
Appendix H

Telephone Prompt

Hello, (Athlete’s name) how are you?
This is (Assistant’s name) from the Special Olympics Athletic Club
You had planned to complete: (Level of aerobics and specific strength exercises)
Have you completed these exercises today?

NO: Are you planning on completing these exercises today?

YES: Good for you, Have you written it in your log book?

NO: Are you planning on completing these exercises today?

YES: Good for you, don’t forget to write it down in your log book.

NO: Is there a reason? (e.g. sick, problems with DVD)

YES: Good for you, don’t forget to write it down in your log book.

NO: Have you changed your mind about participating in the program?

YES: Researcher tries to help e.g. if sick “yes, it is good to rest when you’re sick. Make sure you are better before you exercise.”; or fix the DVD etc.

NO: Could you complete the exercises tomorrow?

YES: OK, that’s fine, thanks for participating. I’ll see you on Thursday.

NO: OK, I’ll have Liz Wood call you to see if you still want to participate.

YES: Good for you, don’t forget to write it in your log book.

NO: OK, I’ll have Liz Wood call you to see if you still want to participate.

YES: Good for you, don’t forget to write it in your log book.

Finish all conversations with either:
You planned to exercise (next planned day) so I’ll talk to you then.
OR
I’ll see you on Thursday at Special Olympics.