The Effects of a General Exercise Program on Task Self-Efficacy and Social Physique Anxiety in Older Adults

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ABSTRACT

Older adults represent the most sedentary segment of the adult population, and thus it is critical to investigate factors that influence exercise behaviour for this age group. The purpose of this study was to examine the influence of a general exercise program, incorporating cardiovascular, strength, flexibility, and balance components, on task self-efficacy and SPA in older adult men and women. Participants (n=114, M_{age} = 67 years) were recruited from the Niagara region and randomly assigned to a 12-week supervised exercise program or a wait-list control. Task self-efficacy and SPA measures were taken at baseline and program end. The present study found that task self-efficacy was a significant predictor of leisure time physical activity for older adults. In addition, change in task self-efficacy was a significant predictor of change in SPA. The findings of this study suggest that sources of task self-efficacy should be considered for exercise interventions targeting older adults.

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Chapter 1: Review of Literature

1.1 Canada's Aging Population

The percentage of Canada's population that is comprised of older adults (over the age of 60) is increasing due to the post-war baby boom and declines in the birth rate that followed (Health Canada, 2002). In addition, the decrease in mortality rates due to diseases of the circulatory system has resulted in gains in life expectancy of 4.1 years for men and 5.0 years for women, since 1950 (Bélanger, 2006). The aging of the baby boomers, combined with continuing lower birth rates and longer life expectancies, is increasing the number of older adults in the Canadian population at unprecedented rates. Estimates suggest the number of adults aged 65 and over will surpass the number of children under age 15 by the year 2015. According to the 2006 Census, the number of Canadians aged 65 and over increased 11.5% in the previous five years, while the number of children under 15 decreased by 2.5% over the same period. Older adults made up a record 13.7% of the total population of Canada in 2006, while the proportion of children under the age of 15 fell to 17.7%, the lowest level seen in Canadian history (Statistics Canada, 2007). Population aging is expected to accelerate in 2011 when the first baby-boom cohort (born in 1946) reaches the age of 65. The period of growth for this age group is expected to last until 2031, when older adults will make up approximately 25% of the total population (Bélanger, Martel, & Caron-Malenfant, 2005).

An aging population means that a greater proportion of Canadians are susceptible to negative health concerns, as older adults are more likely than their younger counterparts to suffer from poor health. More than 25% of older adults face restrictions in their activities due to long-term health problems, with limitations increasing with age (Health Canada, 2002). Chronic conditions, such as diabetes and cardiovascular disease, are more prevalent among adults over age 65, compared to those aged 45 to 64. In the 1999 Canadian National Health Survey, it was reported that seven chronic conditions had a prevalence rate of 10% or higher among older adults. The prevalence of chronic conditions increases sharply after adults pass the age of 60; for example, compared to adults under age 60, incidence rates for high blood pressure for older adults increase from 7% to 35% (Rapoport, Jacobs, & Bell, 2004). Chronic diseases such as cancer and cardiovascular disease represent the most common causes of death among older adults, accounting for approximately 50% of deaths for this age group; for adults 65 and older in 2002, the cause of death from cancer and cardiovascular disease was 20% and 30% of cases, respectively (Turcotte & Schellenberg, 2006). Other common health concerns for older adults include arthritis or rheumatism (55%), back problems (26%), cataracts (25%), osteoporosis (18.75%), thyroid condition (19%), and diabetes (12%) (Health Canada, 2007; Rapoport et al., 2004; Turcotte & Schellenberg, 2006). In addition, 37% of Canadian older adults report experiencing chronic pain or discomfort, while 26% indicate that they have problems with mobility, meaning that they cannot walk or require mechanical support or a wheelchair (Turcotte & Schellenberg, 2006).

Chronic illness among older adults is a highly significant predictor of the use of health care services. In a national study of Canadian older adults, findings suggested that a chronic disease doubles the likelihood that a person over 60 is a frequent user of physician services (Rapoport et al., 2004). The rate of institutionalization is higher for older adults, and in 2003 it was reported that 566,500 non-institutionalized Canadian older adults also used home care services (Rotermann, 2003; Statistics Canada, 1999). In a sample of Canadian older adults in residential care facilities, 53.8% reported six or more physician/clinic visits per year, and 41% per cent reported at least one emergency department visit or hospital admission in the last year. On average, residents saw at least one medical specialist in the previous year, with 83.7% having seen their family physician at least every 6 months (Aminzadeh, Dalziel, Molnar, & Alie, 2004). The demand for health care services presented by an aging population implies greater challenges to Canada's already burdened health care system (Turcotte & Schellenberg, 2006). Given this burden, it is necessary to examine strategies to manage chronic disease in older adults.

1.2 Physical Activity and Older Adults

Older adults represent the most sedentary segment of the adult population. According to the 2008 Canadian Community Health Survey (CCHS), 57% of Canadian adults aged 65 or older are inactive (CCHS, 2008). In addition, results from the National Population Health Survey (NPHS; Statistics Canada, 1999) and the CCHS suggest that participation in physical activity tends to decline with age; in both surveys there was a significant reduction in activity between adults 65 and 74 years, and 75 years and older (CCHS, 2008; Statistics Canada, 1999). Levels of activity were based on the standards used by the Canadian Fitness and Lifestyle Research Institute (CFLRI), which classifies active as an average daily energy expenditure of at least 3 kilocalories per kilogram (KKD) of body weight during the previous 12 months, and inactive as a value less than or equal to 1.5 KKD (CFLRI, 1995).

Inactivity among older adults is a key factor in the development of chronic and debilitating diseases associated with aging, which contribute to a significant number of preventable deaths. In terms of body functioning, the effects of inactivity include loss of bone and muscle strength, decreased cardiovascular and respiratory fitness, lack of flexibility, and increased risk of chronic disease (Warburton, Nicol, & Bredin, 2006). In addition, inactivity is a significant risk factor for functional decline and disability among older adults (Stuck et al., 1999; World Health Organization, 2000).

In contrast, regular physical activity is a significant contributor to positive health outcomes for older adults. The effects of physical activity for this age group include: maintenance of functional ability, increased independence and autonomy, improved psychological health (including improvements in body image and self-efficacy), and reduced risk of chronic conditions such as arthritis, cardiovascular disease, diabetes, colon and breast cancer, osteoporosis, hypertension, anxiety, stress-related conditions, depression, obesity, back pain, falls, and unintentional injuries (Bassey, 2000; Bassey, 2005). Regular physical activity is also necessary for maintaining muscle strength, coordination, joint function and flexibility, as well as functional and cognitive capacity, all of which tend to decrease with age. Furthermore, by facilitating the capacity to carry out activities of everyday life, physical activity promotes autonomy and improved quality of life (Warburton et al., 2006; World Health Organization, 2000). Physical activity also contributes to healthy aging, as it is related to other health behaviours. For example, the risk factors of malnutrition, frailty and sedentary living are interrelated; increased levels of physical activity (appropriate for age and ability) can have a positive impact on these behaviours, creating a cumulative positive effect on overall health (Health Canada, 2002).

While some older adults may be limited in the amount and intensity of exercise they can undertake, it has been found that even moderate physical activity can improve health. Results from the NPHS (1997; Statistics Canada, 1998) showed that the incidence of heart disease and depression among older adults declined with increasing levels of physical activity, when controlling for age and other risk factors. A significant difference was observed between sedentary individuals and those at moderate levels of activity, but not between moderate and active levels (Chen & Millar, 1999). The results suggest that even moderate increases in physical activity, which may be easier to attain among this age group, can result in significant benefits to health.

In 2007, the American College of Sports Medicine (ACSM) and the American Heart Association (AHA) published specific recommendations for exercise for older adults. The recommendations are as follows: older adults should participate in moderate physical activity on 5 days per week, or vigorous intensity on 3 days per week. Aerobic activity with intensity of 5-6 on a 10-point scale is considered moderate, while 7-8 is considered vigorous. Older adults should accumulate at least 30 minutes of aerobic activity at moderate intensity (5-6 on a 10-point scale) per session, in bouts of at least 10 minutes each, or continuous vigorous activity for 20 minutes (Nelson et al., 2007). A 2004 report of the Surgeon General suggests that aerobic activity should be started slowly and should progress in intensity until the heart rate falls in the 60-85% range of maximal heart rate (220-age; U.S. Department of Health and Human Services, 2004). Muscle strengthening activities suggested by the ACSM/AHA include 8-10 exercises of the major muscle groups, with 10-15 repetitions each, on at least 2 days per week. In addition, flexibility and balance exercise should be performed on at least 2 days per week, with the latter being particularly important for those at risk for falls. Health Canada's recommendations for older adults are similar to the ACSM/AHA recommendations, except for flexibility and balance exercises, which are encouraged to be performed daily (Health Canada, 1999).

1.3 Barriers to Physical Activity

In order to optimize the health of older adults through exercise, it is necessary to ensure that they engage in regular physical activity. Maintaining motivation to exercise among older adults is often a challenge, as indicated by significant attrition from structured physical activity programs and personal home-based regimens (Brawley, Rejeski, & King, 2003). Lack of adherence to an exercise program among older adults may be associated with barriers that limit or prevent regular activity. These barriers may be real (e.g., an injury or illness) or perceived (e.g., lack of skill). Regardless of whether a barrier is real or perceived, it will likely interfere with the adoption, maintenance, or resumption of participation in physical activity (Booth, Bauman, Owen, & Gore, 1997). A comprehensive understanding of barriers, particularly those which older adults are likely to experience, is critical in improving efforts to increase adherence to physical activity programs.

The 1997 Canadian Physical Activity Benchmarks Report indicated that the major barriers for active and inactive individuals of any age include time, energy, motivation, illness, fear/injury, and lack of skill; for older adults, long-term illness, injury, and lack of skill were rated as far more significant barriers (Brawley et al., 2003; Craig, Russell, Cameron, & Beaulieu, 1997). Older adults in particular face unique health challenges such as chronic illness, poor health, institutionalization, immobility, and disability, which can be significant barriers to exercise (Health Canada, 2002).

The research available indicates that older adults most frequently report poor health, pain, or fear of pain as the most significant barriers to exercise (Brawley et al., 2003; Clark, 1999a; Clark, 1999b; Lees, Clark, Nigg, & Newman, 2005; Shutzer & Graves, 2004). In a population of community-dwelling seniors, the most commonly reported barriers to exercise were pain and health problems (Cohen-Mansfield, Marx, & Guralnik, 2003). Similarly, a focus group study of 57 older adult women indicated that negative affect and physical ailments were the most significant barriers to exercise (Lees et al., 2005).

There may also be a lack of understanding among this age group in regards to the relationship between moderate exercise and health. Many older adults lived through a time period where exercise was not valued or even considered necessary, especially for women (Shutzer & Graves, 2004). As a result, this age group may not be motivated to exercise because they do not value physical activity as a means to achieve better health. This is a significant barrier to exercise, as knowledge of and belief in the health benefits derived from exercise have been shown to be critical in the initiation period of an exercise program (Shutzer & Graves, 2004). Furthermore, older adults may avoid exercise because they think it is inappropriate for people their age. Older women in particular, may be reluctant to exercise because it is not "ladylike" (Khoury-Murphy & Murphy, 1992). When recruiting older adults for one exercise study, the researchers found that some contacts declined to participate because they were embarrassed to be seen in exercise clothing at a gym, trying to act like a young person (Martin, Leary, & Rejeski, 2000; Sidney & Shephard, 1976). Therefore, one's beliefs about the value, utility, and appropriateness of exercise relative to one's age can inhibit exercise participation.

While some older adults may believe that it is important to stay active to maintain their health, many believe that they already obtain enough exercise from their daily activities, although often this amount is not sufficient (O'Neill & Reid, 1991). Further, many older adults believe that they are too old or frail to engage in moderate to vigorous physical activity or structured exercise regimens beyond their household activities (Shutzer & Graves, 2004). Therefore, although they may be engaging in some physical activity from household tasks, many older adults do not partake in sufficient amounts or types of physical activity.

Barriers to physical activity can also be environmental. Environmental barriers include lack of available places to exercise, no places to sit and rest during a walk, the quality and availability of sidewalks, and inclement weather (Health Canada, 2009; Orsega-Smith, Payne, Mowen, Ho, & Godbey, 2007). Depending on geographical location, older adults living in climates with ice and snow are especially susceptible to environmental barriers, particularly because fear of falling (which is more of a worry when roads and sidewalks are icy) is a significant reason for inactivity, either for outdoor exercise, or for transportation to and from exercise facilities (Lees et al., 2005).

1.4 Exercise Related Self-Efficacy

In addition to poor health, fear, lack of energy and other barriers discussed, psychological factors such as self-efficacy and self-presentational concerns may also act to inhibit or encourage older adults to engage in regular physical activity. Self-efficacy can be defined as an individual's belief in his/her ability to perform a specific task or behaviour (Bandura, 1997). For example, if an individual has high exercise self-efficacy, he/she is very confident in his/her ability to exercise. According to Bandura's Social Cognitive Theory (SCT; 1977), self-efficacy develops from four sources of information, including: performance experience or mastery, vicarious or observational experiences of others, verbal affirmation, and emotional and physiological states.

Performance experience or mastery refers to having successfully performed a task in the past, for example, successfully adhering to a regular exercise program for several years. Performance experience or mastery is the strongest source of self-efficacy; in general, increases in self-efficacy occur with previous successes, while prior failures are likely to decrease self-efficacy. Making tasks simpler in the early stages of an exercise program, or by providing information and education on how to perform tasks properly can foster these successes.

Other sources of self-efficacy are less potent, but can also alter self-efficacy. Vicarious experiences occur when one observes a friend, peer, spouse, or relative successfully complete a task or behaviour. This source of self-efficacy is especially influential if the role model is considered to have similar characteristics, competencies, and abilities to the individual. For example, for older adults, a model that is similar in age and fitness level would likely have a greater impact on self-efficacy than a young, fit person. Verbal affirmation (or social persuasion) refers to words of encouragement from others, before, during or after attempting a new behaviour. When someone provides words of encouragement it can lead people to believe that they can be successful. If the encouragement comes from an individual who is seen as an expert or authority figure, he/she may have an even greater influence on self-efficacy. Finally, emotional and physiological states can also influence self-efficacy. In general, more positive emotions are associated with higher self-efficacy, while more negative emotions are associated with lower self-efficacy. Further, people's interpretation of their physiological states (e.g., heart rate) can impact self-efficacy. When a physiological state is interpreted in a positive way (e.g., recognizing a high heart rate as an indicator of improved fitness), self-efficacy is likely to increase. If it is interpreted negatively (e.g., recognizing a high heart rate as an indicator of poor fitness), it is likely that self-efficacy will decrease.

An individual's level of self-efficacy is critical as it can influence subsequent behaviours (e.g., whether an individual attempts a given task, how long he/she will endure when the task is difficult, and the ultimate success or failure of the behaviour), cognitions (e.g., satisfaction, enjoyment), and affect (e.g., anxiety). According to SCT (Bandura, 1997), the higher one's self-efficacy, the more likely an individual will be to initiate and sustain a specific task, the more likely he/she is to be successful, and the more positive his/her cognitions and affect will be (Bandura, 1977). It is important to note that for exercise behaviour, self-efficacy can be an antecedent as well as a consequence of exercise. That is, participation in physical activity (both acute and chronic) can have a positive impact on self-efficacy, which in turn can positively impact subsequent exercise behaviour, cognitions, and affect (McAuley & Blissmer, 2000).

In regards to exercise behaviour, researchers have focused on different types of self-efficacy, such as confidence in one's ability to perform specific exercises, and confidence in overcoming barriers to exercise. These areas of self-efficacy can be defined as task self-efficacy and coping self-efficacy, respectively (Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002). Task self-efficacy can be described as an individual's confidence in his/her ability to perform the elemental aspects of a task or increasing amounts of exercise (e.g., walking for 30 minutes at a set pace). Coping self-efficacy (a specific form of self-regulatory self-efficacy), is the belief in one's ability to carry out an exercise regimen, in regards to overcoming barriers and scheduling time for physical activity. For example, an individual with high barriers self-efficacy would be confident in his/her ability to continue exercising despite environmental barriers such as poor weather conditions, whereas an individual that believes he/she can follow an exercise program on a regular basis would have high scheduling self-efficacy.

It has been suggested that coping and task self-efficacy are distinct constructs (Bandura, 1990; Maddux, 1995); for example, an individual may be extremely confident in his/her ability to carry out a task, but very uncertain about his/her ability to overcome barriers to that task. The role of each type of self-efficacy changes depending on the stage of behaviour change; it has been shown that task self-efficacy is more important for the initiation stage of exercise, whereas coping self-efficacy is more important in the maintenance of the exercise behaviour (McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003; McAuley, Lox, & Duncan, 1993; Rodgers et al, 2002). This difference may be expected, since one might feel uneasy about starting an exercise regimen if it was not certain that the required tasks could be successfully completed. However, after mastery of the exercise tasks, one would be more concerned about maintaining regular exercise participation even when barriers are present. Understanding variables that have a significant role in the initiation phase of exercise behaviour is especially pertinent for older adults, as the majority has not yet adopted a regular exercise routine and would be entering the initiation stage (Clark, 1996).

Within the literature examining task self-efficacy in exercise settings, several approaches to measuring task self-efficacy have been used. One approach is to use a general measure of physical self-efficacy, or confidence in one's physical attributes such as reflexes, strength, speed, or agility, all of which are important for physical activity. Another approach is to investigate confidence in people's ability to perform incrementally more difficult levels of exercise. These increases in difficulty can be related to time, intensity, or frequency of exercise (e.g., confidence to walk for 20, 25, and 30 minutes, etc). Finally, task self-efficacy has also been conceptualized as confidence in one's ability to perform specific elements of the exercise itself (e.g., walk at an appropriate pace, perform specific exercises).

Previous research examining exercise adherence among older adults indicates that self-efficacy plays an important role in predicting both the initiation and maintenance of physical activity (Rhodes, Martin, & Taunton, 1999; Trost, Owen, Bauman, Sallis, & Brown, 2002; Van der Bij, Laurant, & Wensing, 2002). Furthermore, self-efficacy has previously been tested as a variable in interventions for older adults and has been found to be a consistent influence on exercise behaviour (Brassington, Atienza, & Perczek, 2002; McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003; Resnick, 2001).

To date, research efforts with older adults have primarily focused on the influence of physical activity on self-efficacy. McAuley and colleagues (1999, 2003, 2005) investigated physical activity influences on self-efficacy in a group of 174 older adults (60-75 years) who were randomly assigned to participate in either an aerobic (walking) group or stretching/toning program for 6 months. Both groups attended in-class exercise sessions three times per week. Self-efficacy was assessed using measures of general physical self-efficacy, walking self-efficacy (confidence in the ability to walk in increasing distances, a form of task self-efficacy), exercise self-efficacy (confidence in the ability to exercise 3 times per week for 40 minutes over increasing weeks, up to 8 weeks later) and barriers self-efficacy. Physical activity was assessed by monitoring program attendance and through a self-report physical activity measure at the end of the program as well as 6, 12, 18, and 54 months after program end.

Both groups reported similar scores for walking self-efficacy at baseline, and both groups' walking self-efficacy increased during the intervention and declined during the 6-month follow-up. However, the walking group had larger increases in walking self-efficacy compared to the stretching/toning group during the 6-month intervention, which is logical considering that the walking group was gaining mastery experience in regards to walking while the stretching/toning group was not. This trend was evident throughout all time points, and at 12-month follow-up, the walking group had a higher walking self-efficacy scores compared to baseline, while scores for the stretching and toning group returned to baseline levels (McAuley et al., 1999). For general physical self-efficacy, a similar pattern was found, but for this measure the stretching and toning group had larger increases during the program, and levels remained above baseline at the 6-month follow-up (McAuley et al., 1999). For both groups, the frequency of exercise was the most significant predictor of walking self-efficacy. However, supporting the notion that specific forms of self-efficacy are influenced differently by exercise, when self-efficacy was assessed as exercise self-efficacy (confidence to exercise for 40 minutes, 3 times per week, at moderate intensity over an increasing number of weeks), a different pattern emerged; exercise self-efficacy decreased slightly during the first 4 months of the program, then sharply decreased at program end, with no differences between the two groups. It was suggested that this pattern was a result of being asked to report confidence in the ability to follow a structured regime after the exercise program had ended, as opposed to measuring confidence to perform a specific task, such as walking (McAuley, Jerome, Marquez, et al., 2003).

In a longer follow-up of this particular intervention, self-efficacy was assessed at 6, 12, 18, and 54 months after the end of the program. Participants completed measures of general self-efficacy, and exercise self-efficacy (confidence in ability to perform at least 40 minutes of exercise 3 times per week, at moderate intensity, for incremental weekly periods for the next 8 weeks). The results indicated that physical activity had a positive effect on self-efficacy at every time period except the 54-month follow-up. Together, these studies reinforce the importance of examining different types of self-efficacy in older adults, as they may be differentially influenced by mode of physical activity and timing of assessment (Elavsky et al., 2005; McAuley, Jerome, Elavsky, et al., 2003). It is important to note that for these studies, older adult men and women reported a similar pattern of self-efficacy responses to exercise, although men generally reported higher levels of all types of self-efficacy (Elavsky et al., 2005; McAuley et al., 1999; McAuley, Jerome, Elavsky, et al., 2003).

In another study, Rejeski and colleagues studied a sample of older adults (70-89 years) participating in either an exercise program (including aerobic, strength, balance, and flexibility components) or a successful aging education program for 9 months. The first half of the intervention was held in a facility, with the second half being continued at home. Results of the study showed that walking self-efficacy (confidence in the ability to walk increasing distances) increased for the physical activity group over the first 6 months, and returned to baseline at 12 months. For the education group, self-efficacy decreased consistently over time, and neither age nor gender moderated the relationship (Rejeski et al., 2008)

In addition, several studies have investigated whether self-efficacy predicts subsequent exercise behaviour. McAuley and colleagues (1992, 1993, McAuley et al., 1993) investigated the role of self-efficacy in predicting exercise behaviour during a 5-month supervised walking program and at a 9-month follow-up, in a sample of middle-aged and older adults 45-64 years of age (average age of 54). Self-efficacy assessments and physiological measures were taken at 3 and 12 weeks into the program, and again at 4 and 9 months following program end. Two sets of self-efficacy measures were used: general physical self-efficacy and adherence self-efficacy (a specific measure combining barriers and task self-efficacy items, measuring confidence in one's ability to exercise over incremental 2 week periods). Physical activity was measured using attendance records during the intervention, and through a 7-day physical activity recall during follow-ups. The results indicated that the adherence self-efficacy measure predicted frequency of exercise at week 12, but neither measure (general or adherence) predicted attendance at program end (McAuley, 1992).

In older adults, similar findings have been reported regarding the impact of self-efficacy on subsequent physical activity. McAuley and colleagues conducted a 6-month exercise intervention for older adults aged 60-75 years. As described previously, participants were randomized into either an aerobic (walking) or stretching/toning program for 6 months. Participants completed measures of current physical activity and exercise self-efficacy (confidence in one's ability to do moderate exercise three times per week for increasing lengths of time) at 6, 12, 18, and 54 months following program end. In general, exercise self-efficacy predicted future physical activity, with some time delay. Exercise self-efficacy was a predictor of physical activity at 6 and 18 months, with self-efficacy at 6 months being the strongest predictor of exercise behaviour at 18 months, over and above previous exercise behaviour (Elavsky et al., 2005). Further, self-efficacy at 18 months predicted physical activity at 54 months (McAuley et al., 2007). In addition, at all time points, exercise self-efficacy was positively related to physical activity levels (McAuley et al., 2007; McAuley, et al., 2005). Similar findings with middle-aged adults involved in a 5-month walking intervention showed that task self-efficacy predicted future physical activity. Specifically, adherence self-efficacy (a combination of walking and barriers self-efficacy) predicted physical activity at both the 4-month (McAuley, 1993) and 9-month follow-ups (McAuley et al., 1993).

In a study of cardiac rehabilitation exercise adherence, two different types of self-efficacy (task and self-regulatory) were examined to look at their influence on exercise adherence (Woodgate, Brawley, & Weston, 2005). Participants (average age of 65 years) were post-myocardial infarction patients engaged in long-term exercise maintenance. Measures of walking self-efficacy, scheduling self-efficacy, exercise intensity, and adherence, were collected from 64 participants. Task self-efficacy was assessed with two different measures (walking and in-class self-efficacy) to reflect the different components of the specific rehabilitation program. For each measure, participants were asked to indicate their confidence on a scale of 0-100% in their ability to complete specific tasks (e.g., "Complete the aerobic/cardio component of my cardiac rehabilitation exercise session without breathing too heavily"). Participants were also asked to rate, on average, how hard they anticipated exercising during the aerobic component of the exercise sessions (exercise intensity), and logbooks were used to track adherence. Results of hierarchical regression analysis indicated that both scheduling and walking self-efficacy significantly predicted cardiac rehabilitation exercise attendance and perceived exercise intensity (Woodgate et al., 2005).

These studies demonstrate the importance of examining task self-efficacy and its influence on exercise behaviour for older adults, as well as the influence of exercise on task self-efficacy. These studies are consistent with a review of correlates of physical activity behaviour among adults (including older adults), which reported that self-efficacy is the most consistent predictor of exercise behaviour (Trost et al., 2002). Thus, in older adults, self-efficacy is a critical variable to consider when examining factors related to initiation and adherence to exercise.

1.5 Social Physique Anxiety

While the self-efficacy construct has widely been accepted as a variable related to exercise participation, other psychological factors, such as self-presentational concerns, are now being explored. Similar to self-efficacy, self-presentational concerns may play a role in the adoption and maintenance of exercise behaviour for older adults, and they may also be impacted by exercise. Self-presentation is the process by which individuals attempt to portray a certain image or characteristic to others (Leary, 1992). The model of self-presentation posits that an individual will try to establish and maintain impressions that align with the perceptions he/she wants to convey. Self-presentation involves the selective presentation and omission of aspects of the self to create desired impressions and avoid undesired impressions, particularly in social situations (Leary & Kowalski, 1990). For example, when exercising in a gym, a female who does not consider herself physically strong may feel uncomfortable lifting weights in front of others, and would not engage this behaviour in order to avoid creating a negative impression (in that she might be perceived as being weak). Self-presentation has been the focus of research on a wide variety of interpersonal variables, including attitude development (Schlenker, Forsyth, Leary, & Miller, 1980), perceived exertion (Hardy, Hall, & Presholdt, 1986), and exercise adherence (Crawford & Eklund, 1994). Self-presentation also may be an important determinant of behaviour, cognition, and affect in exercise and sport settings (Hausenblas, Brewer, & Van Raalte, 2004).

Self-presentational concerns may influence exercise behaviour, as physical activity often occurs in a social context (Crawford & Eklund, 1994). For example, if an individual believes he/she is not capable of making a desired impression, he/she may avoid situations that would stimulate these concerns, in order to minimize negative feelings, as well as self-presentational and self-esteem losses. In younger adults, self-presentational concerns may play a role in a sedentary lifestyle (Lantz, Hardy, & Ainsworth, 1997). However these concerns may not be limited to younger populations; in a review of self-presentational influences on health in older adults, it was suggested that these concerns might also deter older adults from being physically active (Martin et al., 2000).

One particular self-presentational concern that may deter an individual from being physically active is the possibility of one's body being negatively evaluated while exercising (Hart, Leary, & Rejeski, 1989; Leary, 1992). This form of self-presentational concern, defined as concern that one's body will be judged by others, is identified as social physique anxiety (SPA; Leary, 1992). The SPA construct has been found to correlate with a number of psychosocial variables such as global self-esteem, body esteem, weight dissatisfaction, and body dissatisfaction, in addition to eating attitudes, motives for exercise, and exercise behaviour patterns (Crawford & Eklund, 1994). In younger adults, SPA may also play an important role in determining where and with whom people exercise (Spink, 1992), affective responses to exercise (Focht & Hausenblas, 2001), and level of effort while exercising (Boucher, Fleischer-Curtian, & Gines, 1988).

The SPA construct has been utilized to explore exercise attitudes and participation among young adults. Previous research has indicated that adolescent exercisers with high SPA may prefer exercising in a private setting (Spink, 1992), and tend to have a less favorable attitude toward exercise settings that include both men and women (Bain, Wilson, & Chaikind, 1989). In addition, high SPA has been related to both excessive and low exercise participation (Frederick & Morrison, 1996; Lantz et al., 1997). Furthermore, adolescents who report high SPA tend to exercise more for self-presentational reasons (Eklund & Crawford, 1994; Frederick & Morrison, 1996), such as weight loss.

While there is evidence that SPA may influence exercise behaviour for young adults, it may also have important implications for older adults. SPA may influence older individuals to participate in physical activity, if they wish to make positive impressions about their youthfulness, independence and physical capacity, thereby controlling negative stereotypes associated with aging such as infirmity, dependence, and reduced physical ability (Martin et al., 2000; McAuley, Marquez, Jerome, Blissmer, & Katula, 2002). On the other hand, older adults may avoid exercise, because the existence of these stereotypes may lead them to believe that they will be negatively evaluated if they attempt physical activity. Older adults may be concerned about the appropriateness of exercise for their age, others' evaluations of their physical abilities, or how they might appear when exercising (Leary, Tchividjian, & Kraxberger, 1994). These physique-related concerns can be a significant barrier to physical activity among this population.

SPA was originally thought to be a relatively enduring characteristic, where any change induced by an intervention would be relatively small. However, research suggests that for middle-aged and older adults, it is malleable with relatively long programs of physical activity (McAuley, Bane, & Mihalko, 1995; McAuley, Bane, Rudolph, & Lox, 1995; McAuley et al., 2002). A study carried out by McAuley, Bane, Rudolph et al. (1995) investigated differences in SPA among adults aged 45-64, divided into 4 age cohorts. Pre-test SPA values revealed that the two older groups (55-59 and 60-64) had significantly lower SPA than the youngest group (45-49). In addition, SPA was significantly lower for the 55-59 age group, when compared to the oldest cohort (60-64). After completing 20 weeks of low-to-moderate intensity walking (led by a trained instructor, three sessions per week), the two youngest groups (45-49 and 50-54 years) significantly reduced their SPA, whereas the scores for the two older groups remained relatively unchanged over the 20-week period. As a follow-up to this study, McAuley, Bane, and Mihalko (1995) examined whether changes in self-efficacy were responsible for changes in SPA following the exercise program. The study included measures of general physical self-efficacy, efficacy to ride a bicycle in increasing time increments, and efficacy to walk or jog at increasing distances. Increases in both walking and general self-efficacy were associated with decreases in SPA. Furthermore, women experienced a greater decrease in SPA than men. This is consistent with research examining SPA in younger age groups (Hart et al., 1989; Martin & Mack, 1996) and older adults (Lanning, Bowden, Owens, & Massey-Stokes, 2004), where it has been shown that women generally report higher SPA than men, and decreases in response to exercise may be more pronounced.

In 2002, a similar study was carried out by McAuley et al., but with older adults. As described earlier, in this study, 174 male and female participants aged 60-75 years were randomly assigned to one of two 6-month supervised exercise programs (aerobic exercise or stretching/toning), with a follow-up six months after program completion. A revised SPA scale (Martin, Rejeski, Leary, McAuley, & Bane, 1997) was used to measure SPA at baseline, and 6 and 12 months later. In addition, a measure of general physical self-efficacy was completed. Following completion of the exercise program, latent growth curve analyses revealed significant reductions in SPA for both groups over the course of the 6-month exercise program, with a small increase during the 6-month follow-up period. These decreases in SPA were associated with increases in fitness and self-efficacy, while a decrease in body weight, frequency of exercise, and activity type were unrelated to SPA. Furthermore, although women reported significantly higher SPA at baseline, the pattern of change between men and women did not differ (McAuley et al., 2002). While the research available is limited, the studies outlined above provide evidence that there is a relationship between exercise, SPA, and task self-efficacy for older adults.

It has been suggested that changes in SPA may come about through a mechanism involving changes in perceptions of capabilities, or self-efficacy. That is, participation in an exercise program will lead to improvements in beliefs about strength, coordination, or fitness, which may result in decreases in SPA when exercising (McAuley et al., 2002). After an individual masters a certain physical task, and increases his/her exercise self-efficacy relative to this specific task, he/she may believe that it is less likely others will negatively evaluate his/her body while performing this task. To investigate the relationship between self-efficacy and SPA, McAuley, Bane, and Mihalko (1995) measured the effects of acute (graded submaximal cycle ergometer test) and chronic (20 weeks of low-to-moderate intensity walking) exercise in initially sedentary middle-aged and older adult men and women (45-64 years of age). Participants completed three measures of self-efficacy: bicycling self-efficacy, walking/jogging self-efficacy, and general physical self-efficacy. Scores on the measures of general physical self-efficacy and walking/jogging self-efficacy improved significantly from pre- to post-test for acute and chronic exercise in men and women, while scores on bicycling self-efficacy increased only for acute exercise. Furthermore, those participants with greater increases in walking self-efficacy had greater decreases in physique anxiety, when controlling for gender and reductions in body fat, weight, and waist/hip circumferences. Specifically, increases in walking and general self-efficacy accounted for 12% of the variation in changes in SPA, over and above physiological variables, with walking self-efficacy being a stronger predictor.

More recently, McAuley et al. (2002) examined the relationship between exercise, general physical self-efficacy, and SPA in older adults enrolled in either an aerobic or stretching/toning program. Structural analyses controlling for treatment condition (aerobic or stretching/toning groups) indicated that improvements in general physical self-efficacy and fitness were significant predictors of changes in SPA, accounting for 19% of the variation, but that changes in body fat, exercise frequency, or exercise type did not contribute to variation in SPA. Furthermore, the pattern of change for SPA was not different for men and women (McAuley et al., 2002). Therefore the relationship between self-efficacy and SPA may play a role in physical activity participation among older adults.

In summary, exercise-related task self-efficacy has been found to significantly influence exercise behaviour among older adults. While different forms of self-efficacy (task and self-regulatory/coping self-efficacy) play a role in different stages of exercise behaviour, task self-efficacy may be particularly important for the initial stages of exercise adoption. Since many older adults have not yet taken up an exercise regimen, task self-efficacy is especially pertinent to this group. In addition, several studies of the relationship between SPA and exercise behaviour have revealed that participation in regular exercise may reduce SPA among adolescents (Eklund & Crawford, 1994, Frederick & Morrison, 1996; Lantz et al., 1997); while the research available is limited, the studies that have tested this relationship among older adults have found that exercise significantly reduces SPA (McAuley, Bane, and Mihalko, 1995; McAuley, Bane, Rudolph, et al., 1995; McAuley et al., 2002). Finally, the relationship between task self-efficacy, SPA, and exercise behaviour for older adults has been explored in two studies; one study found that exercise increased walking self-efficacy, and those with greater self-efficacy had greater reductions in SPA (McAuley, Bane, and Mihalko, 1995), while the other found that physical self-efficacy and improved fitness predicted changes in SPA (McAuley et al., 2002).

Chapter 2: Rationale, Purpose, and Hypotheses

2.1 Rationale

For older adults, physical activity has many positive health outcomes, including maintenance of functional ability, increased independence and quality of life, improved psychological health, and reduced risk of chronic conditions, falls and unintentional injuries (CFLRI, 1995; Health Canada, 2002; McAuley et al., 2002; O'Brien Cousins, 1995; Warburton et al., 2006). Despite these benefits, older adults represent the most sedentary segment of the adult population, with 57% of Canadian adults over age 65 identified as inactive (CCHS, 2008). Therefore it is critical to investigate factors that influence exercise behaviour for this age group.

Self-efficacy has consistently been linked to exercise behaviour among older adults (Brassington et al., 2002; McAuley et al., 1993; McAuley, Jerome, Elavsky, et al., 2003; Resnick, 2001). More specifically, it appears that task self-efficacy, defined as the belief in one's ability to perform a specific exercise or element of exercise, is critical for the initiation and adaptation stages of exercise behaviour (McAuley et al., 1993; McAuley, Jerome, Marquez, et al., 2003; Rodgers et al., 2002). This is an important factor for older adults, as the majority has not yet adopted a regular exercise routine (Clark, 1996). In addition, older adults may be deterred from physical activity if they have concerns about how they may be perceived by others during exercise. In particular, concerns about their bodies being negatively evaluated while exercising, defined as social physique anxiety (SPA; Leary, 1992), may be a significant barrier to exercise (Martin et al., 2000;

McAuley, Bane, Rudolph et al., 1995). However, exercise is also associated with improvements in both these cognitions in older adults (Elavsky et al., 2005; McAuley et al., 1999; McAuley et al., 2002; McAuley, Bane, & Mihalko, 1995; McAuley, Bane, Rudolph, et al., 1995; Rejeski et al., 2008).

Schlenker and Leary's (1982) model of social anxiety, efficacy, and self-presentation posits that social anxiety results from low expectations regarding the ability to produce a preferred impression, resulting in an avoidance of the corresponding behaviour. In this way, social anxiety and self-presentation can be mediated by cognitive factors such as self-efficacy (Schlenker & Leary, 1982). Based on this theoretical model, one would expect to see an inverse relationship between self-efficacy and SPA, where low self-efficacy is associated with high SPA, and high self-efficacy is associated with low SPA. This relationship was explored in two studies in middle aged and older adults (McAuley et al., 2002; McAuley, Bane, & Mihalko, 1995), and findings suggested that increases in task self-efficacy may decrease SPA (McAuley et al., 2002). However, these are the only studies that address the relationship between self-efficacy and SPA in older adults. These studies examined specific modes of physical activity (walking and stretching/toning), however it may be useful to look at the effects of a more comprehensive exercise program that is consistent with physical activity recommendations for older adults (Nelson et al., 2007; Health Canada, 1999). Furthermore, while exercise behaviour and improvements in fitness were found to be predictive of decreases in SPA, these two studies did not investigate whether this relationship can be reversed; that is, if increases in self-efficacy and decreases in SPA are predictors of exercise participation. Therefore, further investigation is required to determine the influence of SPA on exercise behaviour among older adults.

2.2 Purpose

The general purpose of this study was to examine the influence of a general physical activity program, incorporating cardiovascular, resistance, flexibility, and balance training, on task self-efficacy and SPA in older adult men and women. Specifically, the following research questions were investigated:

1. Are task self-efficacy and SPA related to self-reported leisure time physical activity levels in older adult men and women?
2. Does a 12-week general exercise program incorporating cardiovascular, strength, balance, and flexibility components lead to increases in task self-efficacy and decreases in SPA in older adult men and women?
3. Are changes in task self-efficacy and SPA related to adherence to the 12-week program in older adult men and women?
4. Do changes in task self-efficacy contribute to the reduction in SPA during the 12-week exercise program, over and above changes in physiological variables?

2.3 Hypotheses

Based on the research questions outlined above, the following hypothesis were predicted:

1. Baseline task self-efficacy and SPA would predict leisure time physical activity, when controlling for age, gender, and waist/hip circumferences.

This was based on the research of McAuley et al. (2002), which indicated that task self-efficacy and SPA are associated with exercise behaviour in older adults, as well as other studies which showed that task self-efficacy is predictive of exercise behaviour (Elavsky et al., 2005; McAuley, 1992; McAuley, 1993; McAuley et al., 1993; McAuley et al., 2007), and one study which found an association between exercise self-efficacy and leisure time physical activity (Orsega-Smith et al., 2007).

2. A general physical activity program would be associated with increases in task self-efficacy and decreases in SPA; this was expected based on a review of self-efficacy and physical activity among adults which indicates that exercise is highly correlated with self-efficacy (Trost et al., 2002), previous studies which suggest that exercise is associated with increases in task self-efficacy (Elavsky et al., 2005; McAuley, Jerome, Elavsky, et al., 2003; McAuley 1999; Rejeski et al., 2008), and two studies of older adults which both suggested that participation in a structured exercise program was associated with decreases in SPA (McAuley, Bane, Rudolph, et al., 1995; McAuley et al., 2002).
3. Increases in task self-efficacy and decreases in SPA would predict adherence to the exercise program, when controlling for age, gender, and waist/hip circumferences. This was based on a study by Woodgate and colleagues (2005) which found self-efficacy to be a significant predictor of adherence to an exercise program, and another study by McAuley et al.

(2002), which showed that changes task self-efficacy and SPA are associated with exercise behaviour.

4. Increases in task self-efficacy would account for significant decreases in SPA, over and above changes in physiological variables. This was based on Schlenker and Leary's (1982) model which suggests that social anxiety can be mediated by self-efficacy, and the findings of two previous studies which found task self-efficacy to be a significant predictor of SPA (McAuley et al., 2002; McAuley, Bane, & Mihalko, 1995).

Chapter 3: Methods

3.1 Participants

Older adult men and women (*n*=188) were recruited from the Niagara region to participate in a supervised exercise program focusing on balance. Of the 188 participants who completed pre-test measures, 146 (77.6%) returned 12 weeks later for post-test measures. Three participants were removed from the data set, due to impaired cognitive ability. Five participants did not complete elemental components of the exercise program (such as the balance components) and were also removed from the data set. Nine participants did not complete an entire questionnaire (task self-efficacy, SPA, or GLTPAQ) or anthropometric data was missing, and these cases were removed. Finally, 15 cases were randomly selected and removed from the exercise group, so that gender ratios for each group were similar. After removing these cases, and one additional case (a multivariate outlier, see Section 4.3), the total number used for data analysis was *N*=114.

The study followed previous research on self-efficacy and/or SPA and physical activity, which grouped men and women together (Brassington et al., 2002; McAuley et al., 1993; McAuley et al., 2002; McAuley, Bane, and Mihalko, 1995; McAuley, Bane, Rudolph, et al., 1995; McAuley, Jerome, Elavsky, et al., 2003), with the goal being representative numbers from each gender. The sample consisted of 32 men and 82 women; each group had equal ratios of men to women, with 18 men and 47 women in the exercise group, and 14 men and 35 women in the control group. It is important to note that although older men show higher self-efficacy levels and lower SPA, the pattern of change in response to exercise across studies of SPA consistently show that there are no gender differences (Lanning et al., 2004; McAuley et al, 2002). The sample reported a variety of chronic conditions, such as osteoporosis, heart disease, and diabetes. The majority of participants (79.6%) reported taking at least one type of medication. Descriptive statistics for the entire sample and for each group are presented below.

Table 1

Descriptive Statistics for Total Sample (n=114)

Variable	Mean	SD	Min.	Max.
Age	66.82	5.67	57.00	86.00
Height	163.87	8.40	145.00	186.50
Pre-Weight (lbs)	164.54	32.66	101.20	265.00
Post-Weight (lbs)	163.77	32.16	103.20	262.00
Pre-Waist (cm)	91.61	12.95	63.00	134.00
Post-Waist (cm)	91.12	12.35	67.00	134.00
Pre-Hip (cm)	107.30	11.15	89.00	143.00
Post-Hip (cm)	106.63	10.57	89.00	143.00

Note. Waist = waist circumference, Hip = hip circumference.

Table 2

Descriptive Statistics, Exercise Group (n=65)

Variable	Mean	SD	Min.	Max.
Age	66.92	6.08	57.00	86.00
Height	163.81	8.73	145.00	180.00
Pre-Weight (lbs)	168.26	36.08	101.20	265.00
Post-Weight (lbs)	166.96	34.77	105.00	262.00
Pre-Waist (cm)	92.75	13.88	69.00	134.00
Post-Waist (cm)	92.02	13.14	69.00	134.00
Pre-Hip (cm)	108.50	11.82	89.00	143.00
Post-Hip (cm)	107.90	11.10	89.00	143.00

Note. Waist = waist circumference, Hip = hip circumference.

Table 3

Descriptive Statistics, Control Group (n=49)

Variable	Mean	SD	Min.	Max.
Age	66.69	5.15	59.00	82.00
Height (cm)	163.96	8.04	146.50	186.50
Pre-Weight (lbs)	159.61	27.05	103.40	220.00
Post-Weight (lbs)	159.54	28.14	103.20	218.00
Pre-Waist (cm)	90.10	11.58	63.00	114.00
Post-Waist (cm)	89.94	11.22	67.00	114.00
Pre-Hip (cm)	105.72	10.10	89.00	130.00
Post-Hip (cm)	104.94	9.66	90.00	134.00

Note. Waist = waist circumference, Hip = hip circumference.

Exclusion criteria included any cognitive or physical impairment that would prevent a participant from safely performing exercise; in addition, participants were required to be able to walk independently without the use of an assistive device, such as a cane or walker, and to be able to travel to Brock University campus. Finally, participants were not excluded if they were regular exercisers, however they must not have previously engaged in any formal balance training. To recruit participants, posters were placed in community centers in the Niagara region and around the Brock University campus. Older adults recruited for the study were invited to participate at any time that was convenient to them, as participants were accepted on an on-going basis. Continuous enrollment allowed participants to see similar role models of varying fitness abilities at all stages of the exercise program.

3.2 Measures

Participants completed a series of questionnaires (See Appendix A for all consent materials and questionnaires). Immediately following informed consent, participants completed the Physical Activity Readiness Questionnaire (PAR-Q; Canadian Society for Exercise & Physiology, 2002). This is a 7-item measure in which participants respond yes or no to questions assessing whether they can safely increase their physical activity levels. If they answered yes to any of the questions, participants had to obtain permission from their doctors to be physically active. If they answered no to all questions, it was considered safe for them to begin the physical activity program. Since the PAR-Q is only recommended for adults up to 69 years of age, participants 70 years of age and over completed the PAR-Q but also were required to provide written permission from a doctor (regardless of their answers to the PAR-Q), in order to participate. Once participants were cleared for physical activity, they completed a baseline questionnaire package and anthropometric measures were taken.

3.2.1 Baseline Measures

Participants began the baseline test with a series of questionnaires (see Appendix A) to collect the following information: demographics and health information, baseline social physique anxiety, task self-efficacy, and physical activity levels. After completing the questionnaires, anthropometric measures were taken by research assistants.

Demographic and Health Information. Participants completed a Demographic Questionnaire, which asked participants to report their age, gender, height, weight, and medical history (diagnosis of chronic and acute illnesses and injuries, such as cardiovascular disease, osteoporosis, Alzheimer's, arthritis).

Social Physique Anxiety. The 9-item version of the Social Physique Anxiety Scale (SPAS; Martin et al., 1997) was used to assess concerns over having others evaluate one's body. The original SPAS is a 12-item self-report inventory which measures trait SPA. A statement is given (e.g., unattractive features of my physique/figure make me nervous in certain social settings), and the participant is asked to indicate the degree to which the statement is characteristic of him/her, on a 5-point Likert scale ranging from 1 (not at all characteristic of me) to 5 (extremely characteristic of me). Several studies have indicated that a modified version of the SPAS with fewer items is more psychometrically sound than the original version (Hart et al., 1989; Martin et al., 1997; Motl & Conroy, 2000). The 9-item scale has also previously been used in research with older adult populations (McAuley, Bane, & Mihalko, 1995; McAuley, Bane, Rudolph, et al., 1995; McAuley et al., 2002). For the present study, reliability was adequate for both groups (α's ranged from 0.92 – 0.94).

Task Self-Efficacy. Participants' confidence in their abilities to perform the elemental tasks of the exercise sessions was assessed using the Task Self-Efficacy Scale, consisting of 11 items (e.g., how confident are you that you can use safe, effective exercise technique), with responses reported on a scale ranging from 0% (cannot do at all) to 100% (certain can do). The scale was developed for this study, based on previous research examining exercise self-efficacy (Dawson & Brawley, 2000, Rodgers et al., 2002; Woodgate et al., 2005), and in conjunction with recommendations by McAuley and Mihalko (1998) to follow the principle of specificity of measurement. Items reflect participants' confidence in their ability to perform each of the types of exercise in the program (i.e., flexibility, cardiovascular, strength, and balance training) using the proper form and intensity, as well as specific aspects related to a supervised exercise program (e.g., follow directions from the instructor). Where necessary, items were modified to reflect the supervised nature of the program. For the present study, reliability was adequate for both groups (α's ranged from 0.92 – 0.97).

Leisure Time Physical Activity. The Godin Leisure Time Physical Activity Questionnaire (GLTPAQ; Godin & Shephard, 1985) was used to assess leisure time physical activity. Participants were asked to indicate the number of times they engage in mild, moderate, and vigorous physical activity for at least 15 minutes at a time each week on average. A total score was calculated by multiplying the frequencies by 3, 5, and 9, respectively (to reflect the weight of each intensity), and summing the values.

Anthropometric Measures. Upon completion of the questionnaires, anthropometric measures, including height, weight, and waist and hip circumference, were taken. Standard measurements for height and weight were taken using an Ellard statiometer and calibrated scale, respectively. Waist circumference was measured at the narrowest part of the waist, while hip circumference was taken at the widest part of the hips.

Adherence. For participants in the exercise group, adherence was measured upon completion of the program by examining each participant's logbook (description to follow in procedures), and counting the number of sessions marked in the logbook. A percentage was calculated from the number of sessions attended out of a maximum of 36 sessions (3 sessions per week for 12 weeks).

3.2.2 12-week Follow-up

After 12 weeks, all participants (control and exercise group) returned for a follow-up testing session. They completed the same questionnaires, except the PAR-Q. A modified follow-up version for the demographics questionnaire was used to avoid redundancy (see Appendix A). The same anthropometric measures were also taken at follow-up. At this point participants in the control group were invited to participate in the 12-week exercise intervention.

3.3 Procedures

Institutional ethics clearance (see Appendix B) was obtained and all participants provided informed consent. Following completion of the baseline assessments, participants were randomly assigned to one of two groups: exercise or wait-list control, such that approximately half of men and half of women were in each group. At this time, participants were informed of the group to which they had been assigned. For those in the wait-list control group, they were asked not to change any aspect of their lifestyle for the next 12 weeks. They were also told that upon completion of the study, they would be eligible to participate in the exercise study. Participants in the exercise group were asked not to change any other aspect of their lifestyle, with the exception of the exercise program. They were then scheduled for their orientation session of the exercise program.

3.3.1 Exercise Intervention

The exercise intervention took place on Brock University campus, in the Exercise Intervention Laboratory (WH 16). The laboratory was equipped with treadmills, elliptical trainers, recumbent and upright bikes, weight machines, mats, benches, stability balls, step platforms, hand weights and weighted bars, bands, medicine balls, and balance equipment (e.g., BOSUs, wobble boards, balance pods, balance disks, half foam rollers, etc). The lab was open 6 days a week (Monday through Saturday), in the morning (8-9:30 or 8-11:30 am) and evening (5-6:30 pm, on Monday, Wednesday, and Friday only). Participants were advised to come to the intervention three times per week, at any time during hours of operation. Only study participants and staff were permitted to be in the lab during operation hours; since there were only older adults exercising in the lab, participants were less likely to feel that they are being judged or compared to others, especially in regards to appearance and performance. All sessions were supervised by at least 2 students, in small groups up to 15 people. Supervising staff were 3rd or 4th year undergraduate or graduate students enrolled in the Physical Education and Kinesiology (PEKN) program. All students were required to have current first aid/CPR certification, and completed coursework in related fields such as motor behaviour, psychology, and training principles, before assisting with the exercise program. During the exercise sessions, students provided positive reinforcement to participants, which further enhanced their role as "experts" in regards to exercise. This reinforcement also created a beneficial environment, promoting positive affect among participants.

3.3.2 Orientation

Participants in the exercise group first attended an orientation session, which was used to set up the initial exercise program and to teach participants how to perform each exercise properly. At these initial sessions, participants were introduced to the exercise equipment. Proper seat heights and exercise intensities were determined where appropriate, and participants were shown how to perform each exercise correctly. Then, they tried each exercise under supervision, with no overload, until they could perform it correctly. In addition, education was provided in regards to how certain exercise tasks should feel, so that the participant could correctly interpret physiological states (e.g., if participant felt their heart beating rapidly, they would interpret this as a positive state). Next, starting weights for each exercise were determined. A logbook was started for each participant, recording seat heights, starting weights, and number of repetitions to be performed. At this time, the participant's age-related heart rate maximum (220-age), as well as their target heart rate zone (55-85% of age-related heart rate maximum), were calculated. Participants performed all exercises during the orientation under the supervision of a student assistant, who ensured all exercises were performed safely. During this time, participants were free to ask for clarification on any exercise.

3.3.3 Exercise Sessions

Upon completion of the orientation session, participants in the exercise group continued in the exercise intervention three times per week for 12 weeks. Participants were able to attend any three sessions per week that the laboratory was open. Each session lasted from 60-75 minutes, and included a warm-up, cardiovascular training, muscular strength and endurance activities, balance training, flexibility exercises, and a cool-down. This was similar to an intervention that had recently been used for a study of post-menopausal osteoporotic women (Gammage, Lamarche, Klentrou, & Adkin, 2008).

Cardiovascular endurance training (CVE). Participants performed 20-30 minutes total of aerobic activity, using the equipment of their choice (recumbent bike, upright bike, elliptical trainer, or treadmill). They were asked to exercise at 55-85% of their age-related heart rate maximum (220-age). All cardiovascular equipment was equipped with heart rate monitors.

Muscular Strength and Endurance (MSE). During the first six weeks, MSE activities were performed, where possible, on Cybex strength training equipment. One set of 12-15 reps of each of the following exercises was performed: seated chest press, seated row (upper back), triceps pushdown, leg press, shoulder press, and lat pull-down. In addition, hand weights were used to perform the following exercises: bicep curls, lateral arm raises (shoulders), and a stability ball was used to perform a wall squat. Finally, core strengthening exercises included: one set of crunches on the floor, one set of oblique twists, and opposite arm/leg raises. In the last six weeks, the weight training program was adjusted slightly, to incorporate more functional types of activities, requiring stability of the body, and greater balance. These exercises included similar exercises as the first six weeks, but using exercise bands, weighted bars, or hand weights on unstable surfaces such as exercise balls, BOSUs, and balance disks. Core exercises increased in difficulty where appropriate by performing them on the stability ball, or by adding a weighted medicine ball. For strength tasks, the initial resistance was minimal, with difficulty increasing gradually; for both the first and last six weeks, once participants could perform 15 reps of any exercise easily, the trainers increased the weight by the smallest increment available. All exercises were tailored to the individual's abilities and health status, and increased gradually, to ensure participants could successfully carry out all tasks. Where a participant could not perform an exercise (e.g., for medical reasons) an alternative was provided.

Balance Training. The balance training incorporated performance of a balance obstacle course, in which participants were asked to balance on unstable objects such as BOSUs, wobble boards, balance pods, balance disks, and half foam rollers, or maneuver around obstacles. Activities were performed on one and two legs, with eyes open and closed. A spotter was present at all times to ensure participants' safety. To increase difficulty, cognitive and physical tasks were also performed while doing the balance course (e.g., counting backwards by 7's, carrying and balancing objects). Participants completed three cycles of the obstacle course during each exercise session, lasting approximately 10 minutes total. During the beginning of the program, participants were taken through the balance course so that they could complete it with relative ease, with difficulty increasing as the participant became comfortable with the tasks. In addition to the balance course, pitch leans (leaning forward and backward from the ankles) and roll leans (leaning side to side from the ankles) were performed.

Flexibility. A series of stretches were performed at the end of the session, for the following muscles/muscle groups: biceps, triceps, shoulders, chest, upper back, lower back, abdominals, quadriceps, hamstrings, gluts, calves, inner thigh. Each stretch was held for 20-30 seconds.

For all exercises, adaptations were made where necessary depending on exercise contra-indications such as joint problems, osteoporosis or arthritis, recent injury/surgery, difficulty getting down on to and up from floor, etc.

3.3.4 Logbooks

Each participant in the exercise group received a logbook (see Appendix C) to keep track of each exercise session. It included a list of all exercises, with appropriate weights, repetitions, and sets indicated where applicable. Participants indicated when they completed each exercise, and the amount (time/reps) performed so progress could be tracked. All books were kept in the locked storage room in the exercise lab, and were updated weekly by student assistants or the researchers. Participants were also able to leave questions/comments through the logbook. The logbook was used to track adherence to the program.

Chapter 4: Results

4.1 Treatment of Missing Data

Data was entered into the quantitative data analysis software program Statistical Package for the Social Sciences (SPSS) version 18.0. Missing data were screened visually; less than 1% of the data set was missing. For those cases where data for an entire questionnaire were missing, the participant's data was deleted for any analyses involving that questionnaire. Where specific items were missing, a visual inspection revealed that that the missing data was random in nature, with no consistent pattern. As less than 1% of data was missing and there was no consistent pattern, an appropriate subgroup mean was used as a substitute for missing items (Tabachnick & Fidell, 2007).

4.2 Reverse Coding and Subscale Score

Items 5 and 9 on the SPA questionnaire were reverse coded such that higher scores reflected higher SPA. Mean subscale scores were calculated for the task self-efficacy and SPA questionnaires, and METs were calculated for responses to the GLTPAQ. Adherence was calculated by taking a percentage of the number of sessions attended out of a total of 36 (using the logbooks as described previously).

4.3 Outliers

Outliers are extreme values that may distort results of a statistical analysis. The data set was checked for both univariate and multivariate outliers in each group. Univariate outliers for continuous variables are those with very large standardized scores (z-scores), which are disconnected from other z-scores. According to Tabachnick and Fidell (2007), potential outliers can be identified by z-scores greater than 3.29 ($p < 0.001$, two-tailed test). An examination of the z-scores for pre- and post-test scores for task self-efficacy and SPA revealed two outliers for task self-efficacy in the exercise group. To minimize the influence of these outliers, the values were changed to one standard deviation below the next most extreme case in the data set.

To check for multivariate outliers, Mahalanobis' distance was calculated for each case; the calculated values were evaluated using the χ^2 distribution, with degrees of freedom equal to the number of variables of interest ($n = 4$) at $p < 0.001$. Using these criteria, any case with a Mahalanobis' distance ≥ 26.13 was considered a possible multivariate outlier (Tabachnick & Fidell, 2007). Two possible multivariate outliers were identified using these criteria. For one of these cases, the changes in variables from pre- to post-test task self-efficacy and SPA were larger than expected (task self-efficacy increased and SPA decreased), but the direction of change was consistent with the rest of the data and the case was not removed. The other case was examined and found to be a legitimate multivariate outlier, where the direction of change for task self-efficacy and SPA from pre- to post-test was inconsistent with the rest of the data (task self-efficacy decreased while SPA decreased), and the case was removed.

4.4 Normality of Sampling Distribution: Skewness and Kurtosis

The majority of statistical tests are based on the assumption of a normal distribution. There are two aspects to normality of a distribution: skewness and kurtosis. Skewness describes the symmetry of a distribution, while kurtosis has to do with the peakedness of the distribution. Both skewness and kurtosis statistics were calculated for each variable by group, and tested against a null hypothesis of zero by using a significance test as outlined by Tabachnick and Fidell (2007). Skewness and kurtosis tests for all variables were non-significant, except one, which showed a . This suggests that the distribution of pre-test scores for task self-efficacy was too flat with long, thin tails. Given that there are no known transformations for kurtosis, this variable was not transformed.

4.5 Linearity

Linearity occurs when two variables are related by a straight line relationship. The assumption that the data is linear was assessed by examining bivariate scatterplots by group for all possible combinations of variables (Tabachnick & Fidell, 2007). Visual inspection of the plots showed that there was no evidence of any relationship other than linear, and therefore this assumption was met.

4.6 Homogeneity of Variance

Homogeneity of variance describes an ideal situation where there is equal or similar variance across all groups for each independent variable. This assumption was assessed by calculating F_{max} and comparing it to the sample size ratios as suggested by Tabachnick and Fidell (2007). Since the sample sizes were relatively equal across groups (within a ratio of 4 to 1 or less for largest to smallest cell size), F_{max} as great as 10 was considered acceptable. All variables had an F_{max} less than 10 (range from 1.05 – 1.47), and therefore the assumption of homogeneity of variance was met.

4.7 *Multicollinearity*

To test the assumption that there was no multicollinearity, that is, no two variables were correlated so highly that they become redundant, Pearson bivariate correlations by group were calculated. Variables that were highly correlated ($r = 0.90$ or higher; $p < 0.01$) were considered as potential multicollinear variables (Tabachnick & Fidell, 2007). Results of the analyses indicated that there was one correlation above 0.90 in the exercise group. However, this correlation was between pre- and post-test SPA ($r = 0.933$, $p < 0.001$), and a high correlation was expected between values of the same variable at different time points. Therefore, after examination these values were found to be acceptable.

4.8 *Descriptive Statistics*

For the exercise and control groups, descriptive statistics for each variable (pre- and post-test task self-efficacy, SPA and GLTPAQ scores) are presented in Tables 4-5 below.

Table 4

Descriptive Statistics for Exercise Group – Task Self-Efficacy, SPA, GLTPAQ (n=65)

	Mean	SD	Min.	Max.
Pre-SPA	2.38	1.15	1.00	5.00
Post-SPA	2.15	0.99	1.00	4.78
Pre-TSE	85.53	16.51	28.47	100.00
Post-TSE	89.06	10.96	46.36	100.00
Pre-GLTPAQ	28.44	18.25	0.00	84.00
Post-GLTPAQ	33.35	19.32	0.00	77.00
Adherence (%)	91.54	11.66	47.22	100.00

Note. SPA = Social Physique Anxiety scale, responses on items range from 1-5; TSE = Task Self-Efficacy scale, responses on items range from 0-100; GLTPAQ = Godin Leisure Time Physical Activity Questionnaire, responses are ≥ 0. Adherence = percentage of exercise sessions attended, values are 0-100%.

Table 5

Descriptive Statistics for Control Group – Task Self-Efficacy, SPA, GLTPAQ (n=49)

	Mean	SD	Min.	Max.
Pre-SPA	2.22	0.94	1.11	4.56
Post-SPA	2.14	0.88	1.00	5.00
Pre-TSE	83.93	15.06	46.36	100.00
Post-TSE	87.87	10.66	57.27	100.00
Pre-GLTPAQ	32.02	21.95	0.00	98.00
Post-GLTPAQ	35.36	21.91	0.00	122.00

Note. SPA = Social Physique Anxiety scale, responses on items range from 1-5; TSE = Task Self-Efficacy scale, responses on items range from 0-100; GLTPAQ = Godin Leisure Time Physical Activity Questionnaire, responses are ≥ 0.

4.9 Correlations

Bivariate correlations for the entire sample and by group are presented in Tables 6-8 below.

Table 6

Pearson Bivariate Correlations for Total Sample (n=114)

Variable	Pre-SPA	Post-SPA	Pre-TSE	Post-TSE	Pre-GLTPAQ	Post-GLTPAQ
Pre-SPA	-					
Post-SPA	0.88**	-				
Pre-TSE	- 0.20*	- 0.11	-			
Post-TSE	- 0.08	- 0.06	0.55**	-		
Pre-GLTPAQ	- 0.17	- 0.10	0.31**	0.33**	-	
Post-GLTPAQ	- 0.18	- 0.09	0.15	0.21*	0.51**	-

Note. SPA = Social Physique Anxiety scale, responses on items range from 1-5; TSE = Task Self-Efficacy scale, responses on items range from 0-100; GLTPAQ = Godin Leisure Time Physical Activity Questionnaire, responses are ≥ 0.
$*p < 0.05$
$**p < 0.01$

Table 7

Pearson Bivariate Correlations by Group, Exercise (n=65) and Control (n=49)

	Pre-SPA	Post-SPA	Pre-TSE	Post-TSE	Pre-GLTPAQ	Post-GLTPAQ
Pre-SPA	-	0.80**	- 0.23	- 0.28*	- 0.15	- 0.22
Post-SPA	0.93**	-	- 0.21	- 0.23	- 0.10	- 0.06
Pre-TSE	- 0.19	- 0.05	-	0.81**	0.33*	0.11
Post-TSE	0.04	0.05	0.37**	-	0.37**	0.16
Pre-GLTPAQ	- 0.18	- 0.11	0.30*	0.30*	-	0.52**
Post-GLTPAQ	- 0.14	- 0.11	0.18	0.25*	0.49**	-
Adherence (%)	- 0.15	- 0.10	0.11	0.10	0.01	- 0.07

Note. Correlations for exercise group shown below the diagonal, control group above the diagonal. SPA = Social Physique Anxiety scale, responses on items range from 1-5; TSE = Task Self-Efficacy scale, responses on items range from 0-100; GLTPAQ = Godin Leisure Time Physical Activity Questionnaire, responses are ≥ 0; Adherence = percentage of exercise sessions attended, values are 0-100%.
$*p < 0.05$
$**p < 0.01$

Correlations ranged from $r = -0.28$ ($p < 0.05$, between pre-test SPA and post-test task self-efficacy) to $r = 0.93$ ($p < 0.01$, between pre- and post-test SPA). It is important to note that the highest correlations in both groups were between the pre- and post-scores for the same variables. For the control group, the magnitude of the correlation between pre- and post-test task self-efficacy was stronger than in the exercise group, while in the exercise group, the magnitude of the pre- and post-test SPA correlation was stronger than in the control group. Only in the control group was there a significant negative correlation between pre-test SPA and post-test task self-efficacy. For the exercise group, the post-test GTLPAQ scores were positively and significantly correlated with post-test task self-efficacy; however, while this correlation was not present in the control group, there was a significant positive correlation between pre-test GLTPAQ and task self-efficacy.

4.10 Hypothesis Testing

SPA and Task Self-Efficacy as Predictors of Leisure Time Physical Activity. A hierarchical regression was conducted, with pre-test GLTPAQ scores as the dependent variable. Results of the regression are presented in Table 8. The first step of the regression, controlling for age, gender, and waist/hip circumferences was not significant ($F(4,109) = 0.68$, $p > 0.05$, Adj. $R^2 = -0.01$, $R^2 = 0.02$). The second step of the regression, pre-test SPA and task self-efficacy scores, was significant ($F(2,107) = 5.88$, $p < 0.01$, Adj. $R^2 = 0.07$, R^2 change = 0.10), explaining approximately 10.0% of the variance in reported leisure time physical activity; however, beta values indicated that only task self-efficacy was a significant predictor. Semi-partial correlations were 0.30 for task self-efficacy and -0.11 for SPA. Therefore, pre-test task self-efficacy and SPA accounted for approximately 8.7% and 1.2% of the variance, respectively.

Table 8

Hierarchical Regression, Predictors of Pre-Test Leisure Time Physical Activity

Variable	R^2 Change	Beta
Step 1	0.02	
Age		0.03
Gender		- 0.08
Waist Circumference		- 0.14
Hip Circumference		- 0.01
Step 2	0.10**	
Age		0.06
Gender		0.01
Waist Circumference		- 0.14
Hip Circumference		0.19
Task Self-Efficacy		0.32**
SPA		- 0.15

Note. SPA = Social Physique Anxiety scale
*$p < 0.05$
**$p < 0.01$

Influence of Exercise Program on SPA and Task Self-Efficacy. A 2x2 repeated measures MANOVA (group x time) was used to analyze the interaction and main effects of the exercise program on task self-efficacy and SPA scores from pre-test to post-test. Results indicated that there was no significant interaction $F(2,111) = 1.39$, $p > 0.05$, and no significant main effect for group, $F(2,111) = 0.34$, $p > 0.05$. However, there was a significant main effect for time, $F(2) = 8.06$, $p < 0.01$. Follow-up univariate ANOVAS showed a significant time effect for both task self-efficacy, $F(1,112) = 8.52$, $p < 0.01$, and SPA, $F(1,112) = 11.40$, $p < 0.01$. Estimated marginal means collapsing the groups across time were also examined, and results indicated that SPA decreased. From pre-test to post-test, estimated marginal mean and standard errors for SPA were 2.30 (0.10) and 2.14

(0.09). In addition, estimated marginal means for time showed that task self-efficacy increased. From pre-test to post-test, estimated marginal mean and standard error for task self-efficacy were 84.73 (1.51) and 88.46 (1.00). Therefore SPA decreased and task self-efficacy increased significantly over time, regardless of group.

SPA and Task Self-Efficacy as Predictors of Program Adherence. A hierarchical regression was used to predict adherence to the exercise program, for the participants in the exercise group only. Residualized change scores for exercise self-efficacy and SPA were calculated by regressing the post-test scores on the pre-test scores. Simple change scores were calculated for anthropometric data (waist and hip circumferences). Results of the regression are presented in Table 9. The first step of the regression, controlling for age, gender, and changes in waist and hip circumferences, was not significant ($F(4,60) = 0.21$, $p > 0.05$, Adj. $R^2 = -0.05$, R^2 change = 0.01). The second step of the regression, adding residualized change scores for SPA and task self-efficacy, was also not significant ($F(2,58) = 0.55$, $p > 0.05$, Adj. $R^2 = -0.07$, R^2 change = 0.02).

Table 9

Hierarchical Regression, Predictors of Exercise Program Adherence

Variable	R^2 Change	Beta
Step 1	0.01	
Age		0.04
Gender		- 0.07
Change in Waist Circumference		- 0.06
Change in Hip Circumference		0.08
Step 2	0.02	
Age		0.04
Gender		- 0.05
Change in Waist Circumference		- 0.10
Change in Hip Circumference		0.11
Change in Task Self-Efficacy		0.14
Change in SPA		0.07

Note. SPA = Social Physique Anxiety scale
*$p < 0.05$
**$p < 0.01$

Relationship between Task Self-Efficacy and SPA. A hierarchical regression was executed with residualized SPA change scores as the dependant variable. Results of the regression are presented in Table 10. The first step of the regression, controlling for age, gender and changes in waist/hip circumferences, was significant ($F(4,109) = 6.81, p < 0.01$, Adj. $R^2 = 0.17$, R^2 change = 0.20). Semi-partial correlations for age and gender were 0.28 and 0.17, accounting for 7.9% and 2.7% of the variance, respectively; semi-partial correlations for waist and hip circumferences were 0.13 and 0.05, accounting for 1.6% and 0.3% of the variance, respectively. The second step, controlling for GLTPAQ METs, was not significant ($F(1,108) = 0.66, p > 0.05$, Adj. $R^2 = 0.17$, R^2 change = 0.01). The third step, residualized task self-efficacy change scores, was significant ($F(1,107) = 3.96, p < 0.05$, Adj. $R^2 = 0.19$, R^2 change = 0.03), accounting for 3% of the variance.

Table 10

Hierarchical Regression, Predicting Change in SPA

Variable	R^2 Change	Beta
Step 1	0.20**	
Age		- 0.26**
Gender		0.22*
Change in Waist Circumference		0.15
Change in Hip Circumference		0.04
Step 2	0.01	
Age		- 0.28**
Gender		0.22*
Change in Waist Circumference		0.14
Change in Hip Circumference		0.05
Change in GLTPAQ		- 0.07
Step 3	0.03*	
Age		- 0.30**
Gender		0.18
Change in Waist Circumference		0.14
Change in Hip Circumference		0.06
Change in GLTPAQ		- 0.10
Change in Task Self-Efficacy		- 0.18*

Note. SPA = Social Physique Anxiety scale; GLTPAQ = Godin Leisure Time Physical Activity Questionnaire.
*$p < 0.05$
**$p < 0.01$

Chapter 5: Discussion

The purpose of this study was to examine the influence of a general physical activity program on task self-efficacy and SPA in older adult men and women. It was hypothesized that increases in task self-efficacy and decreases in SPA would be significantly greater for participants in a general physical activity program compared to a control group, and that increases in task self-efficacy and reductions in SPA for all participants would predict leisure time physical activity and program adherence. It was also hypothesized that changes in task self-efficacy would predict changes in SPA. The results of this study supported the hypotheses that task self-efficacy predicts self-reported leisure time physical activity, and changes in task self-efficacy predict changes in SPA, however they failed to support the remaining hypotheses.

5.1 Descriptive Statistics

Task Self-Efficacy Scores. The means for task self-efficacy for the sample were somewhat consistent with other studies of similar types of self-efficacy. McAuley and colleagues (2003) reported average exercise self-efficacy across different exercise tasks (walking, biking, sit-ups), ranging from 77-81% at baseline to 82-87% post-exercise – values which are slightly lower than those in the present study. Another study of cardiac rehabilitation patients reported average baseline exercise self-efficacy at 86.7%, which was more similar to the means found in this study. Two other studies reported either very high scores (average of 95%; McAuley, Jerome, Marquez, et al, 2003) or very low scores (averages between 51-57% across age groups; McAuley, Bane, and Mihalko, 1995), however these scores seem unusual compared to other studies. It should be noted that although task self-efficacy was measured in each of these studies, it was operationalized differently in each instance. The variation in scores reinforces the importance of assessing self-efficacy as it specifically pertains to the exercise condition being studied (McAuley & Mihalko, 1998).

Overall the mean scores for task self-efficacy were moderately high, which may have reflected the possibility of participants being overly confident prior to starting the program, due to inexperience with the tasks in the exercise program. This inexperience may have limited their knowledge and understanding of the relative difficulty of many of the exercises. In addition, it is possible that older adults who were already moderately or highly confident in their ability to exercise may have been more likely to volunteer for the study, compared to those having lower self-efficacy, reflecting a selection bias.

Social Physique Anxiety. It is important to note that the mean values of SPA for this study were not particularly high, and less than the midpoint of the possible range of scores. This may reflect a selection bias, as primarily low to moderate physique anxious participants volunteered for the study. It is likely that individuals high in physique anxiety would not volunteer to participate in exercise-related studies; older adults who are sedentary and overweight, or average weight individuals with high body image concerns, may not be willing to become active due to self-presentational reasons (Leary, 1992). This suggestion is supported by results from previous research investigating SPA in older adults (McAuley et al., 2002). These authors found baseline and follow-up scores in a similar range as found in the present study, indicating that older adults appear to experience moderate levels of SPA. These low to moderate SPA scores could also reflect that SPA is less of a concern for older adults than adolescents and younger adults. Another study had SPA scores that were significantly higher, however the sample consisted of adults aged 45-64, with scores decreasing from the youngest to older participants (McAuley et al., 1995). In addition, the means for weight and BMI were higher than those found in the present study, which may explain differences in SPA scores, as SPA is negatively related to weight and BMI (Gay, Monsma, & Torres-McGehee, 2009; McAuley et al., 1995).

Leisure Time Physical Activity. Older adults are considered to be sufficiently physically active if they are expending more than or equal to 35 and 38 METs per week for men and women, respectively (Jacobs, Ainsworth, Hartman, & Leon, 1993). For this study, average leisure time physical activity reported by participants was lower than this amount (28.44 and 33.35 METs for control and exercise group, respectively). This finding is consistent with the CCHS (2008) which reported that the majority of older adults were not sufficiently active. Only one other study of older adults measured leisure-time physical activity, with an average of 9.8 METs reported by the sample, albeit using a different measure (Orsega-Smith et al., 2007), making it difficult to compare directly with this sample. The results of the present study highlight the importance of increasing physical activity participation for this age group.

5.2 SPA and Task Self-Efficacy as Predictors of Leisure Time Physical Activity

There have been no previous studies which have specifically examined task self-efficacy and SPA as predictors of leisure time physical activity, however results from research investigating self-efficacy and exercise behaviour (Elavsky et al., 2005; McAuley, 1992; McAuley, 1993; McAuley et al., 1993; McAuley et al., 2007) support the findings from this study, which found task self-efficacy to be a significant predictor of self-reported leisure time physical activity. Long-term studies of self-efficacy as a predictor of exercise behaviour among older adults have shown that self-efficacy is a strong predictor of self-reported exercise behaviour, over and above previous behaviour (Elavsky et al., 2005; McAuley et al., 2007).

In another study, which specifically addressed the association between self-reported leisure time physical activity and physical self-efficacy among older adults, a significant relationship was also found (Orsega-Smith et al., 2007). This finding and the results of the present study are supported by Bandura's (1977) SCT, which predicts that self-efficacy influences initiation and maintenance of a task; that is, the higher one's exercise self-efficacy, the more likely an individual will be to initiate and sustain exercise behaviour.

There is no available research that has investigated whether or not SPA can predict leisure time physical activity behaviour, however a study of postmenopausal women found that women who reported low activity levels had higher levels of physique anxiety, compared to participants with high activity levels (Ransdell, Wells, Manore, Swan, &

Corbin, 1998). For this study, which specifically investigated self-reported leisure time physical activity and SPA, no significant relationship was found.

Semi-partial correlations for task self-efficacy and SPA for this study revealed that task self-efficacy accounted for a larger proportion of the variance in exercise behaviour. This is supported by a review of self-efficacy and exercise behaviour studies, which reported self-efficacy to be the strongest and most consistent predictor of exercise behaviour (Trost et al., 2002).

Although a regression model with SPA and task self-efficacy as predictor variables was significant, these variables accounted for less than 10% of leisure-time physical activity. This is likely due to the fact that for exercise behaviour, other psychological variables may also be important, such as intrinsic and extrinsic motivation, attitudes and beliefs, and social support; in addition, exercise behaviour may be influenced by non-psychological factors, such as health status, access to and ease of transportation, pain, injury, and fatigue. However the results from this analysis reinforce the idea that self-efficacy is important in predicting exercise behaviour, and contributes to the growing body of evidence that SPA may also be predictive of participation in physical activity in older adults.

5.3 Effects of Exercise Program on Task Self-Efficacy and SPA

As most studies of older adults and exercise have studied either self-efficacy or SPA and not both, to discuss the consistency of the findings from this study in relation to previous research, these two variables will be discussed separately.

Task Self-Efficacy. While the results from this study were consistent with previous research in that task self-efficacy increased after 12 weeks in an exercise program (Elavsky et al., 2005; McAuley, Jerome, Elavsky, et al., 2003; McAuley 1999; Rejeski et al., 2008), there were no differences between the exercise and control group. That is, all participants, regardless of group, increased task self-efficacy over 12 weeks. In studies of changes in self-efficacy before and after a structured exercise program for older adults, self-efficacy increased from baseline to the end of program, and often decreased to baseline levels at follow-up, and these results were found to be significant (Elavsky et al., 2005; McAuley, Jerome, Elavsky, et al., 2003; McAuley 1999; Rejeski et al., 2008). However, the majority of these studies did not use a wait-list control group, limiting the validity of significant results and the ability to draw conclusions about the influence of these exercise programs on self-efficacy. In this study, task self-efficacy increased from pre-test to post-test, consistent with previous research, but the differences between the exercise group and control group were not significant. Therefore the same result may have occurred in previous studies if a control group had been used.

One study of self-efficacy and exercise for older adults did utilize a type of control group by assigning participants to either a walking exercise program or an education program; for this study, self-efficacy decreased over time in the education group, while increasing for the exercise group (Rejeski et al., 2008). Therefore it is unknown whether the inconsistency between previous research and the present study was due to a lack of wait-list control group in most of the previous studies, or other factors that influenced self-efficacy in the control group for this study.

For participants in the exercise group, task self-efficacy increased from pre-test to post-test. This was expected based on previous research, which has found that participation in physical activity (both acute and chronic) can have a positive impact on self-efficacy for older adults (Elavsky et al., 2005; McAuley et al., 1999; McAuley & Blissmer, 2000; McAuley, Jerome, Marquez, et al., 2003; Rejeski et al., 2008). In addition, the exercise program provided positive sources for self-efficacy, using mastery experiences, vicarious experiences, social persuasion, and emotional and physiological states, all of which, according to Bandura (1977), positively influence self-efficacy. For example, since participants were starting the exercise program at different times, new participants were able to see other participants successfully carrying out tasks (vicarious experience). In addition, during the exercise sessions, students provided positive reinforcement to participants during exercise sessions (social persuasion), and education was provided in regards to how certain exercise tasks should feel, so that the participant could correctly interpret physiological states. Furthermore, at the beginning of the program exercises were set at an easy level, and difficulty or complexity was increased only when the participant could comfortably perform the task (mastery). Therefore it was expected that the exercise program would promote an increase in self-efficacy for those in the exercise group.

Overall, the mean scores for task self-efficacy increased over time for the exercise group; however, while 50.8% of participants increased their self-efficacy from pre-test to post-test, 40.0% experienced slight decreases in self-efficacy over time. This may have reflected an underestimation of the difficulty of the tasks prior to starting the program for these participants. For example, prior to starting the program participants may have been overly confident in their ability to complete the exercise tasks, without having a frame of reference for the difficulty of tasks; after completing the program participants may have had a more accurate frame of reference, and self-efficacy may have decreased to reflect a more realistic level of confidence. This pattern has also been found for adherence self-efficacy in another study where participants completed a structured exercise program, where self-efficacy scores also decreased from pre-test to post-test (McAuley, Jerome, Marquez, et al., 2003).

Furthermore, the exercise program was progressed after the first 6 weeks, moving from primarily exercises involving machines to using bands, free weights, and other types of equipment so that more balance-related activities were incorporated. This change, along with the format of the program which involved increasing the difficulty of tasks throughout the program whenever the tasks became easy to complete, may have lessened increases in self-efficacy. For example, balance exercises were set up so that participants' limits would be continuously challenged to increase the ability for recovery and gains in stability; if a participant was consistently being challenged, this may have interfered with mastery of balance tasks, and mastery is the most significant contributor to self-efficacy (Bandura, 1997). Therefore gains in self-efficacy may have been limited by the increasing difficulty of tasks in the exercise program; that is, for participants who did experience increases in task self-efficacy, it may not have increased as much as expected due to the challenging nature of activities. This may explain why task self-efficacy did not increase significantly more for the exercise group when compared to the control group.

For control participants, task self-efficacy also increased from pre-test to post-test. One explanation could be that self-efficacy may have increased in anticipation of starting an exercise program. Self-efficacy scores at post-test for wait-list control participants, immediately after which the participants were to start the exercise program, were significantly higher than pre-test scores. To remain motivated to initiate a structured exercise program and to eliminate any cognitive dissonance, participants in the control group may have been overly confident in their abilities to carry out elemental aspects of the exercise program. For example, a participant may not be likely to report a lack of confidence to execute tasks that they were anticipating completing the following week; in order to be motivated to start the program, it is more likely that they would want to be optimistic about their abilities. In addition, if a participant had never done some of the exercise tasks previously, he/she may have underestimated the difficulty and had increased confidence to complete the exercises.

Social Physique Anxiety. While SPA decreased over the 12 weeks, there were no differences between the exercise and control group. That is, all participants, regardless of group, showed decreased SPA from pre-test to post-test. Currently there have only been two studies that have examined the effects of an exercise program on SPA in older adults. In a study by McAuley, Bane, Rudolph et al. (1995), the influence of exercise on SPA was examined across different age groups, and significantly decreased for the younger age cohorts (45-49 and 50-54 years) only. For the older groups (55-59, 60-64), which are more representative of the older adult population, SPA remained relatively unchanged. In another study, using a population representative of older adults (mean age 66.7 years) there were significant reductions in SPA after 6 months in an exercise program (McAuley et al., 2002). The pattern of change in SPA in this study is consistent with these findings, even though changes were not significant when compared to a control group. However, the latter study did not use a control group, and it is unknown whether SPA may have also decreased in a control group if it had been used.

Furthermore, this significant decrease occurred after a longer exercise program, compared to the one used in the current study. While the SPA construct was originally conceptualized as a relatively enduring characteristic, it can change with relatively long programs of physical activity (McAuley, Bane, Rudolph, et al., 1995; McAuley et al., 2002). The program used for this study was approximately half the length of the exercise programs used in previous research, and may not have been long enough to bring about large increases in SPA. This may explain why decreases in SPA were not significantly larger than for the control group. However, it is promising that, despite the length of the program, decreases in SPA were still found, and this finding supports the idea that an exercise program may be an effective way to reduce SPA in older adults.

For exercise participants, SPA decreased after 12 weeks of exercise, which is consistent with previous research in older adults (McAuley et al., 2002; McAuley, Bane, Rudolph et al., 1995). Exercise participants may have experienced decreases in SPA after exercising, due to changes in body composition and improvements in appearance and body satisfaction, increased confidence and self-esteem. In addition, increases in task self-efficacy and fitness brought about through exercise may have decreased SPA; this is supported by a previous study where task self-efficacy and fitness were significant predictors of SPA (McAuley et al., 2002), as well as the findings of this study, which indicated that changes in task self-efficacy significantly predicted changes in SPA.

For control participants, SPA also decreased from pre-test to post-test. One explanation may be that SPA decreased slightly for control participants, as they may have been less anxious after completing the pre-test anthropometric measures. Since they already knew what to expect during these anthropometric tests, they may have realized it was not a highly threatening situation. This finding is consistent with the self-presentational literature, as social anxiety is likely to be higher in novel or ambiguous situations (Leary & Kowalski, 1995). In addition, during testing the research assistants provided a positive environment and encouragement, which may have made participants more comfortable when they returned to complete post-test measures.

5.4 SPA and Task Self-Efficacy as Predictors of Program Adherence

There has been no research to date that has examined SPA as a predictor of adherence to an exercise program, however two studies have examined self-efficacy as a predictor.

Self-efficacy has been found to significantly predict program adherence for one study of participants enrolled in a cardiac rehabilitation program (Woodgate et al., 2005). In this study, two of the three self-efficacy measures (walking and scheduling) were found to be significant predictors of adherence. The remaining measure, in-class self-efficacy (which most closely resembled the items used for this study, with similar pre-test and post-test scores as those found in the present study) was not found to be significant. Furthermore, previous research has identified task self-efficacy as being more relevant for initiation of exercise behaviour, as opposed to maintenance or adherence (McAuley et al., 1993; McAuley, Jerome, Marquez, et al., 2003; Rodgers et al., 2002). It is also important to note that Woodgate et al. (2005) studied a special population of older adults with cardiovascular disease, therefore limiting direct comparisons.

In another study of older adults from a more general population, two measures of self-efficacy (general and adherence) were not found to be significant predictors of program adherence (McAuley, 1992). One explanation of why self-efficacy was not a significant predictor of adherence may be that there are other factors which had a greater impact on adherence. For example, injury, pain, change in health status, vacations, time constraints, ability to walk a relatively long distance from the parking lot to exercise lab on campus, limited hours of operation for exercise lab, and inclement weather, are potentially significant barriers that may have prevented participants from attending, even if the participant had a favourable psychological disposition (low SPA and high task self-efficacy). Therefore it may be more practical to evaluate task self-efficacy and SPA as predictors of exercise by operationalizing exercise behaviour as self-reported physical activity levels, with responses given for a typical week without major barriers such as injury or vacation time.

5.5 Task Self-Efficacy as a Predictor of SPA

In two previous studies examining self-efficacy and SPA for older adults participating in exercise, it was found that changes in exercise self-efficacy were predictive of changes in SPA (McAuley et al., 2002; McAuley, Bane, & Mihalko, 1995). The findings from this study were consistent with these two studies, suggesting that there is a significant relationship between self-efficacy and SPA for older adults. Schlenker and Leary's (1982) model of social anxiety, efficacy, and self-presentation posits that SPA can be mediated by cognitive factors such as self-efficacy. Based on this model, one would expect to see a relationship between these two variables, where low self-efficacy is predictive of higher SPA, and high self-efficacy is predictive of lower SPA. The results of this study support this theoretical model, and suggest that task self-efficacy should be considered for interventions aimed at reducing SPA in older adults in order to encourage physical activity. While changes in task self-efficacy, age, gender, and changes in waist and hip circumferences accounted for approximately 23% of the variance in SPA, the results suggest that there are other factors that may be accounting for the remaining 77% of variance in SPA. The variance explained in this study was consistent with previous research, and suggests that the SPA construct is a complex cognitive process that is influenced by many factors, such as self-esteem, body satisfaction, fitness, social support, attitudes and beliefs, and other cognitions and emotions.

5.6 Limitations

There are several limitations to this study that must be acknowledged. First, the findings of the study are not necessarily generalizable to all older adults. Participants must be relatively healthy and are required to be able to walk independently to participate in the study. Participants must also be able to travel to and from Brock University and walk a fair distance from the parking lot to the exercise intervention lab, which may be difficult for some older adults, particularly in winter. By excluding those individuals who do not meet these criteria, the results cannot be generalized to all older adults. Furthermore, participants are volunteers and are likely already interested in and motivated to exercise, which may influence subsequent exercise behaviour, as well as cognitions and emotions. If this is the case, the results may not be applicable to older adults who have little interest in starting an exercise program.

While the exercise program is standardized, some variation among participants existed, in terms of the specific exercises, repetitions, and intensity, due to a wide range of ability and physical health among participants. In addition, while participants were asked to make no changes to their lifestyles (except to begin the exercise program for those in the experimental group), it is not possible to control what participants did in their daily lives. For example, approximately 45% of participants assigned to the control condition reported an increase in leisure time physical activity, despite being asked to not make any changes to their lifestyle. Participants may also have changed other health behaviours (e.g., dietary intake, tobacco use, alcohol consumption) which may influence post-test results, particularly body composition, blood pressure, physical health, and psychological well-being.

The sample of participants was not homogenous in regards to pre-study exercise behaviour, as the study did not require participants to have previous exercise experience, and did not exclude those who did. Because the exercise program focused on improving balance, participants were included as long as they did not previously engage in balance training. Therefore, some individuals were sedentary, some were actively participating in daily activities, and some were regular exercisers. As a result, it may be that those who were regular exercisers came into the study with higher task self-efficacy and lower SPA, compared those who were infrequent exercisers or non-exercisers. Many participants also joined the study with a spouse or a friend; through added social support and encouragement, this may have influenced psychological variables, such as self-efficacy, or adherence.

Data collected using the logbooks may have been inaccurate, as the participants were responsible for recording the exercises performed. It is possible that they incorrectly reported the exercises they had completed, or the amount of exercise (e.g., number of repetitions or sets of each exercise). Furthermore, only data pertaining to attendance was collected; information about whether or not all exercises were completed properly was not collected. Therefore, some participants may have attended all sessions, but did not experience significant increases in task self-efficacy and decreases in SPA because not all exercises were completed or executed to the full extent. In addition, some participants missed exercise sessions due to illness, vacations, and other reasons. During the program, participants who experienced decreases in self-efficacy may have decided to withdraw from the program. There may also be seasonal effects, as participants began the program at different times throughout the study (e.g., lower adherence may occur during winter months, when it is more difficult to travel to and from the exercise facility at Brock). Finally, it is difficult to distinguish between the influence of exercise and other aspects of the program, such as the supervised nature of the program and support from other participants or students.

5.7 Future Directions

The majority of previous research studying older adults and self-efficacy or SPA (or both) did not use a wait-list control group to validate the cause and effect relationship between exercise and self-efficacy or SPA. This study used a wait-list control group, and results were generally inconsistent with previous research. Therefore it is necessary for subsequent research to use a wait-list control condition to determine if the positive associations between self-efficacy, SPA, and exercise found in previous studies were valid, or due to a lack of a comparison group. For this study, a significant number of control group participants increased their exercise participation, and this likely affected the results of this study; therefore additional studies using a wait-list control group will need to ensure that participants do not make significant changes to their lifestyle.

The results of this study indicated that, in some cases, it is possible that participants may have overestimated self-efficacy to execute elemental tasks of the exercise program.

Therefore measurement of self-efficacy should be taken after an orientation session, to provide a more realistic frame of reference for participants to use while complete the exercise self-efficacy measure. It may also be beneficial to measure self-efficacy at the halfway point during the program. This was done in several studies examining older adult exercise behaviour and exercise self-efficacy (McAuley, 1992; McAuley et al., 1999; McAuley, Jerome, Marquez, et al., 2003). It is also more practical for this type of program, as the exercises changed slightly at the halfway point, and measurement at this point would serve as a better indicator of the effects of the exercise program on self-efficacy for the tasks being performed during the first half of the program.

It has been suggested that SPA is an enduring characteristic, but can change with relatively long periods of physical activity (McAuley, Bane, Rudolph, 1995; McAuley, Bane, and Mihalko, 1995). The present study used a 12-week exercise program, about half the length of previous studies. The changes in SPA and ESE due to exercise were not significantly different than those in the wait-list control group for this study, therefore further studies should consider an exercise program longer than 12 weeks.

The reported SPA scores for the present study indicated that the recruitment method might have produced a selection bias towards those with low-moderate SPA. Thus, it is essential to investigate which methods are likely to be successful in enrolling individuals with high SPA into exercise programs. In addition, to maximize decreases in SPA during participation in a structured exercise program, other factors should be considered (behaviour of trainers, mirrors, mixed or separated gender groups) which may assist in reducing levels of SPA. Finally, the present study indicated that changes in task self-efficacy (as well as age, gender, and changes in body measurements) significantly accounted for variance in SPA, indicating that SPA may be influenced by these variables for older adults. Therefore, it would be beneficial to investigate how to optimally influence task self-efficacy to result in maximal decreases in SPA, in order to decrease barriers to physical activity for this age group. In addition, while changes in task self-efficacy, age, gender, and changes in waist and hip circumferences accounted for approximately 23% of the variance in SPA, the results suggest that the SPA construct is a complex cognitive process that is influenced by many factors that may explain the remaining variance. Therefore, further study is required to determine other influences of SPA. Furthermore, it may be useful to use a mixed methods approach in further studies of SPA, task self-efficacy, and older adults; qualitative data collection about their SPA experiences would compliment quantitative data and help enrich understanding of changes in SPA and its relationship with task self-efficacy. Finally, a longer follow-up of the present study is necessary to determine if changes in SPA and task self-efficacy, as a result or participation in a structured exercise program, are predictive of subsequent exercise behaviour and maintenance of regular physical activity.

5.8 Implications

The present study's results have practical implications for programs aimed at increasing exercise participation among older adults, whether delivered through public health initiatives, community centers, or commercial fitness programs. For the present study, task self-efficacy was found to be a significant predictor of leisure time physical activity, and thus should be considered when encouraging older adults to exercise. For example, exercises suited to the participant's abilities should be implemented, particularly exercises that have been attempted successfully by the participant prior to program, as well as role models of similar age and ability, to allow participants to experience success in a vicarious manner prior to mastering tasks themselves.

5.9 Conclusion

The present study found that task self-efficacy was a significant predictor of leisure time physical activity for older adults, but changes in task self-efficacy and SPA were not predictive of adherence to a structured exercise program. In addition, a comprehensive exercise program including cardiovascular, strength, balance, and flexibility components did not significantly increase task self-efficacy and decrease SPA when compared to a control group. However, participants enrolled in the exercise program did experience changes in a positive direction for both variables. It is unknown if an exercise program of this nature can invoke significant changes in SPA and task self-efficacy and predict subsequent exercise behaviour, but results of the present study indicate that the use of exercise to influence these variables is promising. Finally, changes in task self-efficacy significantly predicted changes in SPA, suggesting that decreases in SPA may come about through increases task self-efficacy for older adults.

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Appendix A: Questionnaire Package

Brock University

Department of Physical Education and Kinesiology | St. Catharines, Ontario Canada L2S 3A1 | Telephone 905-688-5550 Ext. 4358 Fax 905-688-8364

May 2008

Title of Study: The effects of a physical activity intervention on body image, self-presentational concerns, balance confidence, and trunk sway in older adults.

Principal Investigator: Kimberley L. Gammage, Associate Professor, Dept. of Phys. Ed. & Kinesiology, Brock University
Co-Investigators: Allan L. Adkin, Assistant Professor, Dept. of Phys. Ed. & Kinesiology, Brock University
Nota Klentrou, Professor, Dept. of Phys. Ed. & Kinesiology, Brock University

I, Kimberley L. Gammage, Associate Professor, Dept. of Phys. Ed. & Kinesiology, Brock University, invite you to participate in a research project entitled "The effects of a physical activity intervention on body image, self-presentational concerns, balance confidence, and trunk sway in older adults".

The purpose of this study is investigate the effects of a 12-week physical activity program on body image, concerns about how others think of us, balance confidence, and balance, in men and women 60 years of age and older.

There are 3 phases of this study. The expected duration of Phase 1 is 12 weeks total. During this time you will be asked to complete an initial testing session of approximately 2.5 hours. You will be randomly assigned to either a control group or exercise group. Those in the control group will be asked to not change their lifestyle over the next 12 weeks. Those in the exercise group will be asked to participate in 3 exercise sessions per week, each lasting 60-75 minutes. All participants will then complete a second 2.5-hour testing session. In Phase 2, you may be asked to participate in a focus group lasting approximately 1-1.5 hours. In Phase 3, you will be asked to return one year later to complete the same testing session as the beginning of the study.

This research should benefit the scientific community as we better understand the benefits of an exercise program for older adults. In addition, you will have the opportunity to participate in a supervised exercise program for free. Finally, you will also receive the results of your fitness tests.

If you have any pertinent questions about your rights as a research participant, please contact the Brock University Research Ethics Officer (905 688-5550 ext 3035, reb@brocku.ca)

If you have any questions, please feel free to contact us.

Thank you

Kimberley L Gammage
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Dept. of Phys. Ed. & Kinesiology
Brock University
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kgammage@brocku.ca

Allan L. Adkin
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Nota Klentrou
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Dept. of Phys. Ed. & Kinesiology
Brock University
905-688-5550 ext. 4538
nota.klentrou@brocku.ca

This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board (file # 07-276)

Informed Consent

Date: May, 2008

Project Title: The effects of a physical activity intervention on body image, self-presentational concerns, balance confidence, and trunk sway in older adults.

Principal Investigator: Kimberley L Gammage, Associate Professor
Department of Physical Education & Kinesiology, Brock University
905-688-5550 ext. 3772; kgammage@brocku.ca

Co-Investigators: Allan L. Adkin, Assistant Professor
Department of Physical Education & Kinesiology, Brock University
905-688-5550 ext. 4990; allan.adkin@brocku.ca
Nota Klentrou, Professor
Department of Physical Education & Kinesiology, Brock University
05-688-5550 ext. 4538; nota.klentrou@brocku.ca

INVITATION

You are invited to participate in a study that involves research. The purpose of this study is toinvestigate the effect of a 12-week physical activity program on body image, concerns about how others think of us, balance confidence, and balance, in men and women 60 years of age and older.

WHAT'S INVOLVED

As a participant, you will be asked to participate in 3 phases of the study. In Phase 1, you will attend an initial testing session, in which you will be asked to fill out a series of questionnaires, complete a series of balance tests, and a series of fitness tests. Participation in this session will take approximately 2.5 hours of your time. Then, you will be randomly assigned to either the exercise group or a control group. Those in the control group are asked to lead their normal lives, with no changes to their lifestyles. Those in the exercise group will be asked to participate in a 12-week supervised exercise program. You will be asked to attend the exercise sessions 3 times per week at Brock University. Each session will last approximately 60-75 minutes. The exercise program will consist of a brief warm-up, 20 minutes of cardiovascular activity of your choice, strength training, balance training, and flexibility training, followed by a cool-down. At the end of 12-weeks, all participants will be asked to complete the same questionnaires, balance, and fitness tests as the start of the study. For Phase 2 you may be randomly asked to participate in a focus group. This group will be made up of either all men or all women, and is designed to get participants' perceptions of the exercise program in which they participated. Each focus group will last approximately 1-1.5 hours, will be audio-taped, and will take place on the Brock University campus. In Phase 3, you will be asked to return to Brock one year after previous testing. You will again complete the same questionnaires, balance tests, and fitness tests as you did previously, to examine the extent to which any changes have been maintained. Again, this session will take approximately 2.5 hours.

POTENTIAL BENEFITS AND RISKS

Possible benefits of participation include the benefits associated with physical activity. You will also receive information about your own fitness levels. There also may be risks associated with participation. For example, there is some risk of injury associated with any physical activity. All exercise and testing sessions will be supervised by qualified research assistants. The exercise program is designed for all fitness levels, and will progress gradually, at each individual's own pace. In addition, the nature of some of the questionnaires may lead to some psychological discomfort. However, there are no known instances of any problems resulting from anyone completing these questionnaires. If you do experience any concerns, you may contact Dr. Gammage at the above number or email.

CONFIDENTIALITY
All information you provide is considered confidential; your name will not be included or, in any other way, associated with the data collected in the study. Furthermore, because our interest is in the average responses of the entire group of participants, you will not be identified individually in any way in written reports of this research. Given the format of the group exercise sessions, and the focus groups, we ask you to respect your fellow participants by keeping all information that identifies or could potentially identify a participant and/or his/her comments confidential. Data collected during this study will be stored a locked filing cabinet in a locked storage room on campus. Data will be kept for 1 year following publication of results of the study, after which time all questionnaires will be shredded and audiotapes destroyed. Access to this data will be restricted to the investigators listed above, and their student research assistants.

VOLUNTARY PARTICIPATION
Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time and may do so without any penalty or loss of benefits to which you are entitled.

PUBLICATION OF RESULTS
Results of this study may be published in professional journals and presented at conferences. Feedback about Phase 1 of this study will be available following completion of this phase for all participants. At this time, you will receive feedback about the results of your individual fitness assessments, and the summary of the results of the study. You will receive this information via email or regular mail, as requested. Summaries of the focus group findings will be provided upon completion of all focus groups. Feedback about your one-year follow-up fitness tests and about the summary of these results will again be provided (via email or regular mail) upon completion of the entire study. At this time, you may contact us with any questions you may have about the interpretation of your results.

CONTACT INFORMATION AND ETHICS CLEARANCE
If you have any questions about this study or require further information, please contact the Principal Investigator using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (File #07-276). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

CONSENT FORM
I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name: ______________________________

Signature: __________________________________ Date: ______________________________

Physical Activity Readiness Questionnaire - PAR-Q (revised 2002)

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO	
☐	☐	**1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?**
☐	☐	**2. Do you feel pain in your chest when you do physical activity?**
☐	☐	**3. In the past month, have you had chest pain when you were not doing physical activity?**
☐	☐	**4. Do you lose your balance because of dizziness or do you ever lose consciousness?**
☐	☐	**5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?**
☐	☐	**6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?**
☐	☐	**7. Do you know of any other reason why you should not do physical activity?**

If you answered

YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or
- if you are or may be pregnant – talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME ______________________________

SIGNATURE ______________________________ DATE ______________________________

SIGNATURE OF PARENT ______________________________ WITNESS ______________________________
or GUARDIAN (for participants under the age of majority)

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

continued on other side...

ID # __________

Demographic Questionnaire

Age: ____________________ Gender: Male Female

Height: ____________________ Weight: ________________________

How many times have you fallen in the past year? _______

Please list the approximate date of the fall, the medical treatment required, and the reason you fell in each case (e.g., uneven surface, going down stairs, etc.).

____

Have you ever been diagnosed as having any of the following conditions? Please check all that apply.

	Yes	Approximate year of onset
Heart attack	☐	____________
Transient ischemic attack	☐	____________
Angina (chest pain)	☐	____________
Diabetes	☐	____________
*Parkinson's disease	☐	____________
*Multiple sclerosis	☐	____________
*Rheumatoid Arthritis	☐	____________
Fracture (< 8 weeks)	☐	____________
Osteoporosis	☐	____________
Joint Replacement	☐	____________
Any other problem that interferes with your balance, walking, or ability to do PA?	☐	____________

Do you wear corrective lenses?	Yes	No
Do you use an assistive device for walking?	Yes	No
Do you currently smoke?	Yes	No

Please list the medications you are currently taking.

____

ID #: _______

ESE

Please state your <u>CONFIDENCE</u> in *your abilities* to <u>PERFORM</u> the following behaviours.

Use the scale below to answer.

WRITE the confidence value for each behaviour in the space provided.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately confident					Completely confident	

How confident are you that you can: **0-100%**

1. Carry out your activity for the planned duration? _______
2. Pace yourself to avoid over-exertion? _______
3. Perform all the required movements? _______
4. Follow directions from an instructor? _______
5. Use safe, effective exercise technique _______
6. Monitor your exercise progress _______
7. Monitor and regulate the intensity of your exercise so you feel you've had a good workout _______
8. Perform any stretches provided in the exercise sessions _______
9. Perform any provided resistance training exercises _______
10. Perform the aerobic portion of the exercise sessions _______
11. Perform the balance portion of the exercise sessions _______

ID #: _______

GLTPAQ

1. Considering a **7-day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free-time** (write on each line the appropriate number)?

Times Per Week

(a) STRENUOUS EXERCISE
(HEART BEATS RAPIDLY) __________
(i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

(b) MODERATE EXERCISE
(NOT EXHAUSTING) __________
(i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

(c) MILD EXERCISE
(MINIMAL EFFORT) __________
(i.e. yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)

ID #: _______

SPAS

Read each of the following statements carefully and indicate the degree to which the statement is characteristic or true of you, according to the following scale:

1 = Not at all characteristic of me
2 = Slightly characteristic of me
3 = Moderately characteristic of me
4 = Very characteristic of me
5 = Extremely characteristic of me

1. I wish I wasn't so uptight about my physique/figure. _____
2. There are times when I am bothered by thoughts that other people are evaluating my weight or muscular development negatively. _____
3. Unattractive features of my physique/figure make me nervous in certain social settings. _____
4. In the presence of others, I feel apprehensive about my physique/figure. _____
5. I am comfortable with how fit my body appears to others. _____
6. It would make me uncomfortable to know others were evaluating my physique/figure. _____
7. When it comes to displaying my physique/figure to others, I am a shy person. _____
8. I usually feel relaxed when it is obvious that others are looking at my physique/figure. _____
9. When in a bathing suit, I often feel nervous about the shape of my body. _____

ID # __________

12-Week Follow-up

Has your health changed in the last 12 weeks (e.g., diagnosed with a new disease)?

Yes or No

If yes, please explain:

____

Have you fallen since your initial visit?

Yes or No

If yes, please list the approximate date of the fall, the medical treatment required, and the reason you fell in each case (e.g., uneven surface, going down stairs, etc.):

____

ID #________ Date: __________________/ Pre or Post

Questionnaires:

Dem___ ABC-F___MBSRQ___SBF___SPAS___SA-ES___SPE___SF36___SSE___GLTPAQ___24DIET___
BSE___SSES___ESE ___ABC-S___

PAR-Q: _____

Heart Rate: ________bpm Cut-off: 100bpm

Blood Pressure: _____________ Cut-off: 144/94

Height: _____ cm

Weight: _____ kg _________lbs (lbs = kg * 2.2)

Waist circumference: ________ cm

Hip circumference: __________cm

Waist/hip: ___________

BALANCE TESTING: complete separate sheet.

ENDURANCE TESTING:

HR at 2 minutes: _________ bpm

HR at end of 5th minute: __________ bpm

HR at end of 6th minute: __________ bpm

AVERAGE 5TH AND 6TH: _________bpm

MUSCULAR FITNESS TESTING:

Abdominal test: Maximum # completed ________

Push-up test: Maximum # completed __________ Type: Full Modified Wall

Leg press test:

WARM-UP: Females 20lbs, Males 40lbs for 10 repetitions

Weight lbs/.9 _____________

Weight lifted (lbs) of 5 reps__________

FLEXIBILITY TESTING:

TWIST TO RIGHT: 1st Trial: ________ 2nd Trial: __________ BEST: ___________

TWIST TO LEFT: 1st Trial: ________ 2nd Trial: __________ BEST: ___________

Exercise Intervention Information Sheet

Parking Information:

1. You will be parking in visitor Lot D, just outside David Howes theater.
2. We will provide you with a parking pass. Each pass contains 10 parking visits. When you need a new pass, please ask a trainer in the lab, and they will get you one.

Every time you come to the exercise lab, you should bring the following with you:

1. Bottle of water, a small towel, and a snack.
2. Comfortable, loose fitting, breathable (e.g., cotton) clothing, such as shorts and a t-shirt.
3. Clean, indoor running shoes.

The lab is open the following times:

Monday, Wednesday, Friday – 8-11:30am and 5:00-6:30pm
Tuesday, Thursday, Saturday – 8-9:30am

***Please note: From January 11th – April 30th our hours will be as follows:**

Monday, Wednesday, Friday – 8-11:30am and 4:30-6:30pm
Tuesday, Thursday, Saturday – 8-10:30am

If you need to contact someone with questions, here is our information:

General Inquiries:

Lab: 905-688-5550 ext. 4147

Questions about testing:

Larkin Lamarche: larkin.lamarche@utoronto.ca
Kerry Ransom: kerry.ransom@gmail.com

Anything else:

Kim Gammage 688-5550 ext. 3772, kgammage@brocku.ca

Initial Test Date: ____________

Approximate 12-week Test Date: _________

Appendix B: Ethics Approval

From: Research Ethics Board [mailto:reb@brocku.ca]
Sent: Monday, April 28, 2008 11:01 AM
To: Kimberley Gammage; Allan Adkin; Panagiota Klentrou
Cc: Michelle McGinn
Subject: REB 07-276 GAMMAGE - Accepted as Clarified

DATE: April 28, 2008

FROM: Michelle McGinn, Chair
Research Ethics Board (REB)

TO: Kimberley L. GAMMAGE, Physical Education and Kinesiology
Allan Adkin, Nota Klentrou

FILE: 07-276 GAMMAGE

TITLE: The effects of a physical activity intervention on body image, self-presentational concerns, balance confidence, and trunk sway in older adults

The Brock University Research Ethics Board has reviewed the above research proposal.

DECISION: Accepted as Clarified

This project has received ethics clearance for the period of April 28, 2008 to January 9, 2010 subject to full REB ratification at the Research Ethics Board's next scheduled meeting. The clearance period may be extended upon request. ***The study may now proceed.***

Please note that the Research Ethics Board (REB) requires that you adhere to the protocol as last reviewed and cleared by the REB. During the course of research no deviations from, or changes to, the protocol, recruitment, or consent form may be initiated without prior written clearance from the REB. The Board must provide clearance for any modifications before they can be implemented. If you wish to modify your research project, please refer to http://www.brocku.ca/researchservices/forms to complete the appropriate form Revision or Modification to an Ongoing Application.

Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Principal Investigator, the safety of the participants and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and clearance of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-Council Policy Statement requires that ongoing research be monitored. A Final Report is required for all projects upon completion of the project. Researchers with projects lasting more than one year are required to submit a Continuing Review Report annually. The Office of Research Services will contact you when this form *Continuing Review/Final Report* is required.

Please quote your REB file number on all future correspondence.

MM/kw

Kate Williams
Research Ethics Assistant
Office of Research Ethics, MC D250A
Brock University
Office of Research Services
500 Glenridge Avenue
St. Catharines, Ontario, Canada L2S 3A1
phone: (905)688-5550, ext. 3035 fax: (905)688-0748
email: reb@brocku.ca
http://www.brocku.ca/researchservices/ethics/humanethics/

Appendix C: Logbook Sheets

Logbook – First 6 Weeks

Dates: ____________________ Subject ID: ________

PA Intervention Exercise Log Sheet

Cardiovascular Endurance Training (Goal: 20-30 minutes)

Equipment: ________	Equipment: ________	Equipment: ________
Resistance: ________	Resistance: ________	Resistance: ________
Time: ________	Time: ________	Time: ________
Heart Rate: ________	Heart Rate: ________	Heart Rate: ________

Muscle Strengthening

Muscle	Exercise	Weight	Goal Reps	Sets	Actual Reps	Actual Reps	Actual Reps
Upper Back	Seated row						
Chest	Seated chest press						
Quads	Seated leg press						
Calves	Seated calf raises						
Triceps	Triceps press down						
Biceps	Biceps curl						
Shoulders	Lateral raises						
Legs	Squat with ball against wall						

Balance/Core Strengthening

Exercise	Equipment/Position	Weight	Goal Reps	Sets	Actual Reps	Actual Reps	Actual Reps
Abs							
Obliques							
Low Back							
Leaning	Side-side & front-back			3			
Balance Pods				3			

Flexibility (10-20 seconds each)

Muscle	Completed			Muscle	Completed			Muscle	Completed		
Biceps				Chest				Quadriceps			
Triceps				Hamstrings				Calves			
Shoulders				Gluts				Hip Flexors			
Upper Back				Low Back							

Logbook – Last 6 Weeks

Dates: ____________________ Subject ID: ________

PA Intervention Exercise Log Sheet

Cardiovascular Endurance Training (Goal: 20-30 minutes)

Equipment: ________	Equipment: ________	Equipment: ________
Resistance: ________	Resistance: ________	Resistance: ________
Time: ________	Time: ________	Time: ________
Heart Rate: ________	Heart Rate: ________	Heart Rate: ________

Muscle Strengthening

Muscle	Exercise	Weight	Goal Reps	Sets	Actual Reps	Actual Reps	Actual Reps
Upper Back	Standing row with band						
Chest	Chest press with bar						
Quads	Single leg press						
Calves	Standing calf raises						
Triceps	Triceps press with bar						
Biceps	Bicep curl on disc						
Shoulders	Lateral raises on disc						
Legs	Squat with ball against wall						

Balance/Core Strengthening

Exercise	Equipment/Position	Weight	Goal Reps	Sets	Actual Reps	Actual Reps	Actual Reps
Abs							
Obliques							
Low Back							
Leaning	Side-side & front-back			3			
Balance Pods				3			

Flexibility (10-20 seconds each)

Muscle	Completed			Muscle	Completed			Muscle	Completed		
Biceps				Chest				Quadriceps			
Triceps				Hamstrings				Calves			
Shoulders				Gluts				Hip Flexors			
Upper Back				Low Back							