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Understanding strength training behaviour in older adults using the theory of planned behaviour

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Understanding Strength Training Behaviour in Older Adults Using the Theory of Planned Behaviour

A Thesis
Presented to the
School of Kinesiology
Lakehead University

In Partial Fulfillment
of the Requirements for the
Degree of Masters of Science
in
Kinesiology,
with specialization in Gerontology

by Rachel Dean

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Abstract

The purpose of this study was to use the constructs of the Theory of Planned Behaviour to gain a better understanding of older adult's participation in strength training. Two hundred participants aged 55 years and older completed a questionnaire which assessed the constructs of the theory. Participants were classified into four groups based on self reported levels of participation in physical activity. The groups included strength plus aerobic trainers (SAT), strength trainers (ST), aerobic trainers (AT), and non-trainers (NT). Results revealed no significant differences between the groups on attitudes. Both the ATs and the NTs differed significantly from the two strength training groups on perceived behavioural control. The NT group also differed from the two strength training groups on subjective norms. The ATs were significantly different from the SATs on behavioural beliefs and both the ATs and NTs were statistically different from the SATs on control beliefs. Subjective norms and perceived behavioural control were the strongest predictors of intention. These findings provide information about the constructs that should be targeted in intervention programs designed to increase strength training participation in the older population.

Dedication

This thesis is dedicated to my grandma Cartier, who inspired me to achieve the most I possibly could in life. She always believed in me and was my strongest supporter. I know she would be very proud of how far I have come.

Acknowledgments

First and foremost, I would like to thank my advisor, Dr. Joey Farrell, for all of her support, encouragement, and direction. Her guidance allowed me to create a study which was all my own, and the skills that I developed under her direction have helped me to become a more organized, independent, and confident researcher.

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Last but not least, I would like to thank Nicholas Zuback for all of his help and encouragement. Nick was involved at every stage of this thesis, from brainstorming ideas, to collecting data, to proof-reading. I could not have done it without him! Thank you for all of your patience and understanding!

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Introduction

In order to live a healthy and well-balanced life, all of the components of physical fitness including strength, endurance, balance, and flexibility, must be incorporated into an individual's weekly exercise program. For older individuals, walking is the most popular form of physical activity. Although endurance training, such as walking, is essential for maintaining and improving cardiovascular functioning, it can not prevent the deterioration of muscle mass that occurs with normal aging (Spirduso, 1995). Progressive strength training refers to an activity in which muscles move dynamically against weight (or other resistance) with small but consistent increases in the amount of weight being lifted over time (Seguin & Nelson, 2003). Strength training is a proven safe and effective way to increase muscular strength in older adults (Fiatrone et al.,1990; Tsutsumi, Don, Zaichkowsky & Delizonna, 1997; Mazzeo et al., 1998). Muscular strength is a major determinant of an individual's ability to perform functional tasks such as climbing stairs, performing household chores, carrying groceries, and even rising from a chair. Strength training can also increase bone mass, improve postural stability, reduce the risk of falls, decrease the pain of osteoarthritis, aid in the control of type II diabetes, prevent depression, and build self-confidence (Seguin & Nelson). For these reasons, participation in strength training can have significant implications for improving quality of life and prolonging independence in older age.

Despite the benefits that strength training can provide, rates of participation decrease with age. Unfortunately, the vast majority of theoretical and applied research in the field of sport and exercise psychology has concentrated on mainly aerobic activity (Tsutsumi, Don, Zaichkowsky & Delizonna, 1997). As a result, the factors that influence

older adults participation and/or non-participation in strength training are not well understood. Although few in number, the studies that have investigated older adults beliefs and attitudes toward strength training, have revealed that older adults face psychological and social barriers which prevent them from participating (O'Brien Cousins, 2000; Khoury-Murphy & Murphy, 1992). Other research has found self-efficacy and social support to be important determinants in the adoption and adherence of a strength training program (Rhodes, Martin & Taunton, 2001). A better understanding of the factors that influence older adults participation in strength training, is a necessary prerequisite for the design and implementation of effective interventions which encourage more individuals to take part.

The Theory of Planned Behaviour has been applied to many health behaviours including addiction, breast self examination, eating, HIV/AIDS, and oral hygiene. The theory has proven useful in predicting general exercise behaviour but has rarely been applied specifically to strength training. Although applied to older adults in other behaviours, few studies have applied the Theory of Planned Behaviour to exercise in this population, and none have applied the theory to strength training in this population.

Purpose and Hypothesis:

The purpose of the present study is to use the constructs of the Theory of Planned Behaviour to gain a better understanding of why older adults do or do not participate in strength training. The constructs, including attitudes, subjective norms, perceived behavioural control, behavioural beliefs, normative beliefs, and control beliefs, will be used in an attempt to differentiate between four groups. Strength plus

aerobic trainers, strength trainers, aerobic trainers, and non-trainers, will be examined to determine if the factors that influence their participation in strength training differ. Aerobic trainers are unique in that they are already physically active yet do not take part in strength training. Non-trainers on the other hand, do not participate in any physical activity and therefore, may have barriers not just toward strength training but toward physical activity in general. It is hypothesized that both strength training groups (the strength plus aerobic trainers and the strength trainers) will have higher scores on the dependent variables (the constructs of the theory), compared to the aerobic trainers and the non-trainers. It is also hypothesized that the aerobic trainers will have higher values on the dependent variables than the non-trainers.

A second purpose of this study is to test the efficacy of the Theory of Planned Behaviour in predicting strength training behaviour in the older population; an application that has not been studied to date. Based on previous research examining the Theory of Planned Behavoiur and exercise, it is hypothesized that attitudes and perceived behavioural control will be the strongest predictors of intention to do strength training in older adults.

Knowledge of the factors that influence older adults participation in strength training can help public health professionals to design interventions which encourage more older individuals to become involved. The promotion of strength training within the older population will help seniors become healthier, stronger, and more independent in their later years.

Review of Literature

Physiological Changes in Muscle with Age

Sarcopenia is a term used to describe the decrease in muscle mass and strength that occurs with age (Saxon & Etten, 2002). Sacropenia occurs due to a decrease in the size of muscle fibers, decrease in the number of muscle fibers, and a decrease in the number of motor units (Saxon & Etten; Spirduso, 1995). Between the ages of 50 and 70 years, there is a 30% reduction in strength (Mazzeo et al., 1998). As well, between the ages of 20 and 90 years there is a 50% decrease in total muscle mass (Brandon, Gaasch, Bioyette & Lloyd, 2000).

Importance of Strength

Data from the Framingham study (Mazzeo et al., 1998) indicate that 40% of women aged 55 to 64 years, 45% of women aged 65 to 74 years, and 65% of women aged 75 to 84 years were unable to lift 4.5 kg. In addition, a similarly high percentage of women in this population reported that they were unable to perform some aspects of normal household work.

Activities of daily living refer to activities related to daily living that are important for continued independence (Brandon et al., 2000). Moderate levels of strength are needed to carry out *basic activities of daily living* including eating, dressing, bathing, and moving around independently. *Instrumental activities of daily living* include housekeeping, shopping, and transportation. *Advanced activities of daily living* include travel, hobbies, recreational exercise, employment, and participation in social and

religious groups. All of these activities have important implications in terms of quality of life (Spirduso, 1995). Strength is needed not only to perform all of these activities, but it also determines the ease with which these activities are performed and the level of fatigue experienced afterwards. Physically fit individuals have a greater functional reserve capacity to perform the basic and immediate activities of daily living, thus leaving them with more energy to perform the advanced activities of daily living that they enjoy (Taylor, 2002).

Muscle strength is also critical for those with advancing age and very low activity levels, such as institutionalized patients (Mazzeo, 1998). Fiatrone et al. (1990) found a strong relationship between quadriceps strength and habitual gait speed in frail institutionalized men and women over the age of 86 years. The importance of strength, and the opportunities to preserve functioning in this population, should not be ignored.

Physiological Benefits of Strength Training

Despite the declines in physiological functioning that tend to occur with age, the rate of decline in strength is not inevitable. Parallels exist which suggest a link between the age when physical activity levels are reduced, and the time when accelerated declines in functional capacity are observed. In fact, some experts believe that disuse accounts for up to half of the decline that occurs between the ages of 30 and 70 years (Govindasamy & Paterson, 1994). Muscle fibres have an amazing ability to adapt to the demands placed on them, and this ability does not change with age (Mazzeo et al., 1998). Older individuals have been found to experience similar or even greater strength gains compared to young individuals following participation in a progressive strength

training program (Fiatrone et al.,1990; Tsutsumi, et al., 1997). As a result, sarcopenia can be slowed by remaining physically active and incorporating strength training into one's life.

Additional Benefits for Older Adults

The American College of Sports Medicine's position stand on Exercise and Physical Activity for Older Adults notes that aside from increasing muscle mass and strength, strength training also improves bone health and helps offset the typical age-associated declines in bone mass (Mazzeo et al., 1998). As well, strength training improves postural stability, reduces the risk of falling, and reduces the severity of injuries associated with falls. Strength training is also an effective way to increase energy requirements, decrease body fat mass, and maintain metabolically active tissue mass in healthy older people. Increased energy is expended not only from the activity of lifting weights but also from the increased resting metabolic rate that occurs when lean muscle mass is added. Strength training also improves insulin action in older adults, therefore aiding in the control and prevention of type II diabetes (Mazzeo et al.). Strength training can also reduce the signs and symptoms of osteoarthritis, with "strength trainers" experiencing significant reductions in pain and stiffness, and improved physical functioning compared to those who do not participate in the activity (Seguin & Nelson, 2003). Taking all of these benefits into account, strength training can offer more benefits than any pill or medicine can provide.

Psychological Benefits of Strength Training

In addition to the physiological benefits of strength training, participation can also provide numerous psychological benefits. Tsutumi et al. (1997) found that older individuals who participated in high and low intensity strength training programs reduced their scores on tension and trait anxiety, and improved their scores on vigor compared to a control group. These findings highlight that, in addition to the important physiological benefits that strength training can provide, older adults can also experience improved psychological well-being as a result of participation. Overall, the psychological and physiological benefits of strength training discussed in this review, illustrate the efficacy of strength training in improving the quality of life of the older population.

Physical Activity Participation in Older Adults

Despite the benefits that strength training can provide, participation in the activity remains low. Table 1 demonstrates that, as age increases, participation in strength training decreases. Research that investigates the reasons for the decreased rates of participation with age is needed. A better understanding of the factors influencing older adult's participation in strength training will assist public health professionals in the design of interventions that help more older adults become involved and stay involved in the activity.

Table 1. Strength training participation with age

Age Groups	Muscular Strength and Endurance Exercises
	Percent
18 to 24 years	28
25 to 44 years	21
45 to 64 years	14
65 to 74 years	10
75 years and older	7

Note. Adapted from *Healthy People 2010* (n.d.). Retrieved Nov. 30, 2003, from: www.healthypeople.gov/document/html/objectives/22-04.htm

Psychological and Social Barriers to Strength Training

Despite the physiological and psychological benefits that strength training can provide, it appears that older individuals hold significant barriers which prevent them from taking part in the activity. Although little research has been conducted specifically on older adults and their views toward strength training, several qualitative studies exist which provide exploratory data describing the psychological barriers held by older adults.

O'Brien Cousins (2000) conducted a qualitative study of older women's beliefs about six common fitness activities. The *perceived* risks and benefits of taking part in walking, cycling, aquacise, a slow stretch, curl ups and push ups were assessed. Overall, O'Brien Cousins found that the women acknowledged a wide range of health benefits for the fitness activities yet at the same time held major concerns about their

health and safety. The study also found that the participants perceived a wide range of benefits for the walking, cycling, and aquatic activity, but were less sure of the benefits of the strength and flexibility exercises. For the stretching, curl ups and push ups, many of the women guessed at the benefits. O'Brien Cousins stated that the women recognized these activities as legitimate elements of exercise but did not seem to know exactly what good they could offer. In terms of the risks for these activities, one woman was concerned about her heart hemorrhaging during a curl up, while another thought she would throw her back out during a stretch. O'Brien Cousins stated that these findings add weight to other research showing that, exercise leaders must overcome serious cognitive barriers when presenting health promoting activity to older people.

O'Brien Cousins concluded that when worrying about wearing out their bodies and incurring serious injuries, many aging women overestimate the health risks of exercise and underrate its health-promoting potential. The researcher also stated that "when considering what is appropriate exercise, older women are suspicious and even afraid of activity that challenges their muscle strength or makes them bend in ways to which they are not accustomed" (p. 291). She also stated, "lacking direct experience and aware of their vulnerability, older women may show their concern about participating by anticipating outcomes that are frightening, injurious, and even mortal" (p. 292). These concerns may actually serve as excuses to justify why they should not be expected to perform these activities, even though they simultaneously understood them as having many benefits. Overall, the O'Brien Cousins study provides insight into some of the psychological barriers that older women hold toward various forms of physical activity. Although some insight can be made about the psychological barriers

held toward strength training, more research is needed which exclusively focuses on this topic.

Khoury-Murphy and Murphy (1992) conducted a qualitative analysis on the cultural impediments that older southern women face when accepting an exercise program that involves strength training. The study involved implementing a strength training program for older women at a community college and "convincing" the older women to participate. Due to the women's reluctance to become involved in the activity, the researchers were able to uncover four key cultural obstacles to strength training that the older women faced.

The first obstacle was the belief that weight lifting is physically dangerous. At the initiation of the program, many of the women believed that strength training would put them at special risk for overexertion, muscle damage, and back injuries. The second obstacle was the fear that weight lifting would masculinize the female body and make them too muscular. The third cultural obstacle was the belief that weight lifting was not only inappropriate for women, but also an activity associated primarily with the working class. Many of the women stated that it would characterize them as "unladylike" if they were to participate. Finally, the fourth obstacle was the belief that lifting weights makes a person sweat excessively. In comparison to other activities that they considered appropriate for their gender and age, the older women considered weight lifting to be "dirty" and too strenuous, and they wanted to avoid sweating profusely.

Khoury-Murphy and Murphy concluded that since none of the women had ever set foot in a weight lifting gym, the ideas that they held about weight lifting must have been derived from the media's depictions of it. As a result, the researchers developed

several strategies to help the older women overcome these barriers. Some of the strategies included exercising in a remodelled home and using small pastel coloured hand weights. By distancing strength training from the stereotypical and masculine images associated with it, the older women began to realize the benefits that strength training had to offer. The women not only began to feel better, but they also believed that their efforts might result in greater long-term social independence. Overall, this study by Khoury-Murphy and Murphy, provides insight into some of the cultural/social barriers that may influence older women's participation in strength training.

Predictors of Adoption and Adherence to Strength Training

A study by Rhodes et. al. (2001) examined the predictors of adherence to a strength training program in older women aged 75 to 80 years. Regression analysis revealed that self-efficacy and social support explained 36% of the variance in adherence to the strength training program at 0 to 3 months. Self-efficacy alone explained 24% of the variance. At 4 to 6 months, adherence at 0 to 3 months, explained 30% of the variance in adherence and the addition of self-efficacy explained a total of 42% of the variance in adherence. These findings highlight the role of self-efficacy, social support, and past participation in the adoption and maintenance of strength training behaviour.

Unfortunately, all of the studies described in this review, have focussed exclusively on women. As a result, little is known about the experience of older men and strength training. These studies also represent a limited amount of research that has been conducted on the psychological aspects and/or determinants of older adults'

participation in strength training. In order to advance the knowledge of the factors that influence older adults participation in strength training, it is necessary to apply theory to the topic. The application of theory will help researchers to navigate the data, integrate knowledge, and form a lense through which the behaviour is examined (Kelley, 2004).

The Theory of Planned Behaviour

A number of theories have been developed in an attempt to explain why individuals participate in regular physical activity. Ajzen and Fishbein's Theory of Reasoned Action (TRA) states that intention is the main determinant of behaviour and that intention is formed through attitudes and subjective norms. The Theory of Planned Behaviour (TPB) added the construct of perceived behavioural control, thus forming a model in which three conceptually independent variables determine a person's intention to perform a behaviour (Courneya, 1995). According to the Theory of Planned Behaviour:

> *Intention* is defined as a person's willingness, and how much effort he or she is planning to exert to perform the behaviour (Caron et al., 2003). According to the theory, the stronger a person's intentions, the more likely he or she will be to engage in the behaviour.
>
> *Attitude* is defined as a person's positive or negative evaluation of performing a behaviour (Caron et al.; Courneya). In other words, it is an

individual's outcome expectation.

Subjective norm is defined as the perceived pressure/ expectation that an individual feels to perform or not perform a behaviour (Caron et al.).

Perceived behavioural control (PBC) is defined as the perceived ease or difficulty of performing a behaviour (Caron et al.). Note, this construct is conceptually similar to self efficacy (Courneya). Perceived behavioural control may also be a direct determinant of behaviour if the behaviour is not completely volitional (Courneya). In others words, the direct effect of perceived behavioural control on behaviour accounts for barriers that affect behaviour despite the best intentions (Brenes, Strube, & Storandt, 1998).

The Theory of Planned Behaviour proposes that people will intend to perform a behaviour when they evaluate it positively, believe that important others think they should perform it, and perceive it to be under their own control (Courneya, 1995). In turn, the stronger the intention, the more a person is expected to try and therefore, the greater the likelihood that the behaviour will actually be performed.

TPB also attempts to account for the underlying beliefs that lead to attitudes, subjective norms and perceived behavioural control (Courneya, 1995). Attitudes are formed by behavioural beliefs, subjective norms are formed by normative beliefs, and perceived behavioural control is formed by control beliefs. According to the theory:

Behavioural Beliefs (BB) are defined as the perceived consequences of carrying out a specific action along with a personal evaluation of each of the consequences (Caron et al., 2003).

Normative beliefs (NB) are defined as the "perceived expectations of important significant others or groups, and the individuals motivation to comply with the expectations of these significant others" (Caron et al., p. 152).

Control beliefs (CB) are defined as the perceived "presence or absence of required resources and opportunities, the anticipated obstacles or impediments to the behaviour, and the perceived power of a particular factor to facilitate or inhibit performance of the behaviour" (Caron et al., p.153).

As Figure 1 demonstrates, behavioural beliefs, normative beliefs and control beliefs indirectly effect intention through attitudes, subjective norms and perceived behavioural control. Attitudes, subjective norms and perceived behavioural control indirectly effect behaviour through intention. As noted earlier, perceived behavioural control can also directly effect behaviour if the behaviour, is not under complete volitional control.

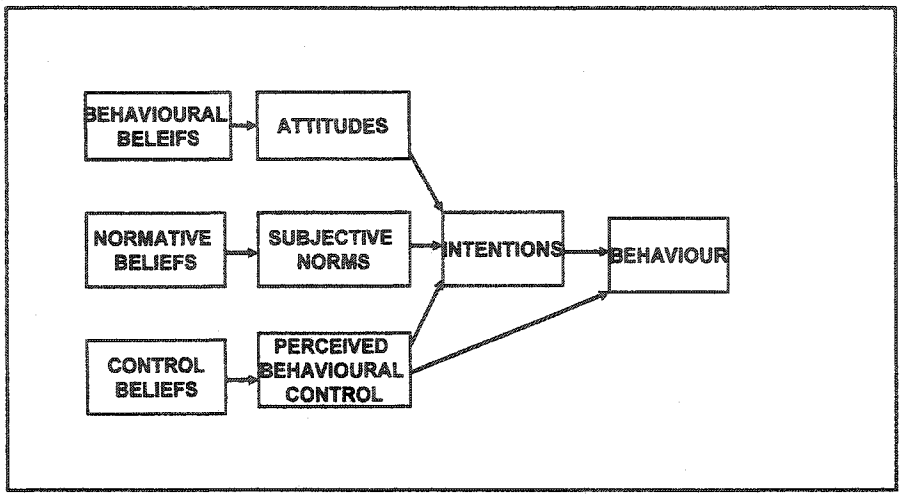

Figure 1. Theory of Planned Behaviour

Studies Incorporating the Theory of Planned Behaviour

Numerous studies have validated the predicted relationships between the variables of the Theory of Planned Behaviour. Godin and Kok (1996) conducted a meta-analysis of a number of health-related studies that used the Theory of Planned Behaviour to explain intention or predict behaviour. The meta-analysis included studies on addiction, automobile, clinical/screening, eating, exercising, HIV/AIDS, and oral hygiene behaviour. Fifty-six studies were examined in total, 18 of which were classified as studies on exercise.

For all applications of the Theory of Planned Behaviour, the overall average correlation between intention and the constructs attitude, subjective norms and perceived behavioural control were 0.46, 0.34 and 0.46 respectively. The overall average explained variance in intention was 40.9%. Perceived behavioural control was a significant predictor of intention in 85.5% of the applications, while attitude was a

significant predictor of intention in 81.6% of the applications. Subjective norm was a significant predictor of intention in 47.4% of the applications.

For all applications, the overall average correlation between behaviour and intention was 0.46, while the overall average correlation between behaviour and perceived behavioural control was 0.39. The overall average explained variance in behaviour was 34%. Overall, intention was found to be the most important variable accounting for the most explained variance (22.5% of the 34% explained variance).

In the exercise studies, Godin and Kok found the correlation between intention and the TPB constructs, attitude, subjective norms, and perceived behavioural control to be 0.51, 0.30 and 0.50 respectively (see Table 2). As well, they found that intention had a higher correlation to behaviour than perceived behavioural control, which suggests that exercise behaviour is mainly under the control of the individual.

This finding is consistent with the findings of Hausenblas, Carron and Mack (1997) who also conducted a meta-analysis and found that attitude had a large effect on exercise intentions (ES = 1.2, SD = .05) while subjective norms had a moderate effect (ES = 0.56, SD = .07). These researchers also found perceived behavioural control to have a large effect on both intention to exercise (ES = 0.97, SD = .04) and exercise behaviour (ES = 1.01, SD = .05), however the effect of intention on behaviour was slightly larger (ES =1.09, SD =.07).

Table 2 Averaged correlations between TPB constructs and exercise intention/behaviour

	Averaged correlation between intention and...			Averaged correlation between behaviour and....	
	Attitude	Subjective Norms	PBC	Intention	PBC
Exercise	0.51	0.3	0.5	0.52	0.41

Overall, these meta-analytic studies concluded that the Theory of Planned Behaviour is a good fit to explain health related behavioural *intentions*, however, when explaining health related *behaviours*, its efficacy varied. These studies concluded that both attitude and perceived behavioural control are important variables in explaining exercise behaviour. The Godin and Kok study also highlighted the fact that the efficacy of the model varies between health related behaviour categories and that the strength of the intention-behaviour relationship is clearly linked to the type of behaviour under study. As a result, when using the TPB, it is important to investigate each behaviour independently, since different applications lead to a different patterns of results. In other words, researchers can not assume that the variables that predict general exercise behaviour are the same as the variables that predict strength training behaviour. In addition, researchers can not assume that the variables that predict strength training behaviour in the younger population are the same as the variables that predict strength training behaviour in the older population.

Bryan and Rocheleau (2002) made the distinction between aerobic training and strength training by assessing the efficacy of the Theory of Planned Behaviour to

predict aerobic versus strength training exercise. The researchers stated that individuals who engage in aerobic activity versus strength training often have different goals (e.g., to slim down versus to "buff up") and the difficulty of performing these two activities (e.g., the level of PBC) may be quite different. The authors stated that one only has to own a pair of running or walking shoes to engage in aerobic activity, whereas strength training may require access to a training facility or at least access to specific equipment. As a result, the relationship among the TPB constructs is likely to be different for the two types of exercise behaviours.

The participants in this study consisted of first year psychology students (average age 18.59 years) from the University of Connecticut. In the study examining aerobic exercise behaviour, the correlations between intention and attitude, subjective norm, and PBC were 0.47, 0.39 and 0.64 respectively. The correlation between intention and behaviour was 0.42. Perceived behavioural control also had a direct effect on behaviour with a correlation of 0.37. The model accounted for 47% of the variance in intentions and 19% of the variance in aerobic behaviour.

In the study examining strength training behaviour, intentions were strongly correlated with attitudes (0.56), subjective norms (0.44), and PBC (0.79). The correlation between intention and behaviour was 0.59. Perceived behavioural control also had a direct effect on behaviour, and in this instance, it was more strongly correlated with behaviour than were intentions (0.61 versus 0.59). The study revealed that the fit of the model for strength training was actually a better fit than that of aerobic exercise.

Overall, the authors concluded that the Theory of Planned Behaviour is a valid

model for predicting both aerobic and strength exercise behaviours. Perceived behavioural control was a dominant predictor of both intention and behaviour, especially in the case of strength training. The authors suggest that perhaps strength training is under less volitional control than aerobic exercise due to the increased equipment and training needed for the activity. As a result, PBC becomes a more significant direct predictor of strength training. They suggested that the strong relationship between PBC and strength training behaviour may account for the superior predictive utility of the Theory of Planned Behaviour in predicting this activity versus aerobic exercise (Bryan & Rocheleau, 2002). This study demonstrates that since different factors influence the two behaviours in different ways, specific interventions are required for different types of exercise.

Few studies have looked at the Theory of Planned Behaviour and exercise in older adults. A study by Michels and Kugler (1998) examined the ability of the Theory of Planned Behaviour to predict exercise in older Americans. This study looked at individuals in their early retirement years (aged 65 to 70 years) and found that the variables of the TPB were strongly associated with intent to exercise and that PBC contributed significantly to the model. The authors noted that studies using younger participants tend to find attitude to be significantly associated with intent but do not tend to find subjective norms to be predictive. Overall, the authors concluded that the Theory of Planned Behaviour provides a valid model for predicting both the intent to exercise and actual exercise behaviour in older adults. Unfortunately, this article used few statistics to demonstrate its findings, therefore, comparisons with other studies are difficult.

Another study by Brenes, Strube and Storandt (1998) examined the application of the TPB to exercise among older adults aged 55 years and older. This study was limited by the fact that most of the participants intended to exercise and therefore, there was a lack of variance in the variable intention. As a result, only behaviour was used in the regression equation. The study found that attitudes, subjective norms, and PBC, directly explained 9% of the variance in exercise behaviour at 1 month, but did not significantly explain behaviour at 3 months and 9 months. However, exercise behaviour at 1 month was a significant predictor of exercise behaviour at 3 months, accounting for 15% of the variance. Exercise behaviour at 1 month and 3 months accounted for 11% of the variance in behavoiur at 9 months. This study suggests that past exercise behaviour, may be an important predictor of current exercise behaviour in older adults, and therefore, this variable requires closer examination.

Examination of the Secondary Constructs

Conn (1998) attempted to identify the underlying beliefs that older women hold toward physical activity using the constructs of the Theory of Planned Behaviour. The study compared the behavioural beliefs, normative beliefs, and control beliefs of participants in an exercise study to those in another study based on physical activity. In the study, *physical activity* was defined as bodily movement produced by skeletal muscles that requires energy expenditure. *Exercise* on the other hand, was defined as a form of physical activity, consisting of repetitive bodily movements.

In the physical activity study, the most commonly mentioned advantages of being

Table 3 Results of Conn (1998)

	Physical Activity Study	N	Episodic Exercise Study	N
Advantages	*Social:* Opportunities to be with others *Mood:* Better mood Avoid depression Keeps the mind busy	26 16	Improves overall health Feel better	191 0
Disadvantages	Stress Time	64	Increases painful symptoms	28
Referents	Family Social network Physician	40 29 18	Family Physician Social network	15 13 5
Makes it easy	Good health Social environment Internal motivation Pleasure Money	21 19 16 14 13	Routine	13
Makes it difficult	Fatigue Poor health Fear (being out at night) Caregiving	14 12 6 2	Health problems Time	181 4

physically active (behavioural beliefs) related to social and psychological health (see Table 3). Most women reported that being active improved their social life by providing opportunities to be with other people. The psychological benefits included positive mood responses, avoidance of depression, and keeping the mind busy. Few women listed disadvantages to physical activity, however, those that did, reported feelings of stress, having too many commitments, lack of sufficient time, fear of injury, and fatigue. When asked about important referents who approve of their physical activity (normative

beliefs), most participants mentioned children, friends, family members other than spouse, and over half mentioned their doctor. In terms of perceived control (control beliefs), the most important factor that made physical activity easy, was good health. The social environment, internal motivation, and pleasure derived from the activity were also listed. Fatigue was listed as the most common factor that made physical activity difficult. Poor health, fear, and care-giving responsibilities were also listed.

Comparing these results to those of the exercise study, there were several differences in the perceived advantages and disadvantages. Recall, in the physical activity study, social and mood advantages predominated. However, no women in the exercise study mentioned social advantages of exercise and only a few mentioned mood advantages. The advantages listed for exercise focused on health and fitness outcomes and feeling better physically. Another difference was that only a few women in the physical activity study mentioned disadvantages, whereas almost all of the women in the episodic exercise study noted that exercise could be accompanied by increased painful symptoms. There were also differences in the types of referents listed who support the activity. In the physical activity study, social networks were mentioned more than physician support, however, in the episodic exercise study physician support was listed more often than social networks. As far as barriers, both samples listed health problems as a significant barrier to their activity. One difference that existed was that time constraints were listed as a barrier to exercise, however, it was not mentioned as a barrier to physical activity. In terms of the factors that make the activity easy, having a routine was the only item reported in the exercise study. In the physical

activity, a robust list of factors were mentioned including, good health, peers, desire, pleasure, money.

It is expected that the participants in the proposed study, will have similar behavioural beliefs, normative beliefs, and control beliefs toward strength training, as the participants in the exercise study by Conn. Strength training is a more structured form of physical activity and as the definition of exercise suggests, consists of repetitive bodily movements. Similar evaluations of older adults BBs, NBs and CBs will provide detailed information about the factors that influence their participation in strength training.

Relevance to the Research

Overall, from this review of literature it is evident that limited research has been conducted on the psychological aspects of older adults and strength training. In addition, few studies have used the TPB to examine exercise behaviour in the older population, and no studies have specifically used the TPB to predict strength training behaviour in the older population. Without an understanding of why older adults do or do not participate in strength training, it will be difficult to design effective interventions which help more individuals become involved. An overwhelming amount of research supports the benefits of strength training and these benefits are not exclusive to young people. The benefits of strength training not only lead to enhanced physical functioning, but also lead to enhanced quality of life through positive psychological and social changes. When an older individual is stronger, he/she will be better able to carry out

his/her activities of daily living with greater ease, thus leaving them with more energy to perform the leisure activities that he/she enjoys.

The purpose of this study is to examine older adults attitudes, subjective norms, perceived behavioural control, behavioural beliefs, normative beliefs, and control beliefs toward strength training, in order to gain a better understanding of the factors that influence their participation and/or non-participation in the activity. Another purpose of the study is to determine if the TPB is a useful model for predicting strength training behaviour in the older population, since this application has not yet been applied. It is the researcher's hope that this study will provide insight into the directions that need to be taken in order to help more older individuals become involved and stay involved in this beneficial activity.

Method

Participants

The sample consisted of 200 adults aged 55 years and older. Participants were recruited from various locations in Thunder Bay, Woodstock, and London Ontario. The locations sampled included seniors centres, community recreation centres, senior exercise classes, a bowling league, a mall, a retirement home, and a church. Individuals of all activity levels were recruited, including those who participate in strength training, those who participate in aerobic training and those who did not participate in any structured physical activity.

Instrumentation

A Strength Training Questionnaire (see Appendix A) was adapted by the researcher, based on previous research using the Theory of Planned Behaviour (Godin & Kok (1996); Courneya (1995); Brenes et. al. (1998); Bryan & Rocheleau (2002)). Commonly used questions, which assess the Theory of Planned Behaviour constructs, were modified to be applicable to strength training behaviour and the older population. All responses were provided on a 7 point Likert scale.

Behaviour:

Behaviour was assessed by asking "How many days a week do you participate in strength training?" Responses included 0 to 7 days a week.

Intention:

Strength training intention was assessed by asking participants to respond to the following statements: "I pan to strength train on a regular basis within the next 3 months" and "I will try to strength train at least 2 to 3 times a week within the next three months."

Attitude:

To assess attitude, participants rated strength training as: "useless" to "useful", "harmful" to "beneficial", "foolish" to "wise", "unenjoyable" to "enjoyable", "unhealthy" to "healthy." Responses to these five statements were then summed and divided by five to get an attitude score. A high score represented a positive attitude toward strength training.

Subjective Norm:

To assess subjective norm, participants "agreed" or "disagreed" with the following statements: "Most people who are important to me think I should strength train", "Most people who are important to me would/do support my participation in strength training", "Generally speaking I want to do what most people who are important to me think I should do." Responses were summed and divided by three to obtain a subjective norm score. A high score represented high subjective norms to do strength training.

Perceived Behavioural Control:

To assess perceived behavioural control, both perceived control and perceived difficulty to do strength training were assessed. For perceived control, participants "agreed" or "disagreed" with the statement: "If I chose to, I could strength-train any time I wanted to." To assess perceived difficulty, participants responded to the statement: "Overall, for me to engage in strength training would be...", by rating the task as "extremely difficult" to "extremely easy." Responses to these two statements were then summed and divided by two to obtain a perceived behavioural control score. A high score represented high perceived behavioural control (or self-efficacy) to do strength training.

Behavioural Beliefs:

To assess behavioural beliefs, both the perceived benefits (outcomes) of strength training were assessed, followed by the perceived importance (evaluation) of those benefits. To assess the perceived benefits of strength training, participants were asked to "agree" or "disagree" with the following statement: "I believe that strength training can/could help me to...." Benefits that were assessed included: improve health, improve fitness, increase energy level, improve mood, improve muscle strength and tone, lose/control weight, improve/maintain ability to perform daily tasks, improve maintain confidence to do daily tasks, prevent falls or decrease the severity of falls, improved/maintain bone density, and relieve

stress/tension. The perceived importance of those benefits was then assessed. For example, to assess the perceived importance of the benefit "relieves stress/tension", participants were asked to "agree" or "disagree" with the following statement " Relieving stress/tension is important to me." The perceived benefits (outcomes) were then multiplied by their respective evaluations and then all scores were summed to yield a behavioural belief score. A high score represented positive behavioural beliefs toward strength training.

Normative Beliefs:

Normative beliefs were assessed by the perceived expectations of important others to engage in strength training and the motivation to comply with those important others. The perceived expectations of spouse/partner, children, friends, and doctor, were assessed by asking "My ____ would/does support my participation in strength training." Participants "agreed" or "disagreed" on a 7 point Likert scale or they could respond "not applicable" or "don't know." To assess the motivation to comply with those significant others, participants "agreed" or "disagreed" with the following statement: "Generally speaking, I want to do what my ____ thinks I should do." The perceived expectation of each person was then multiplied by the motivation to comply with that person. All scores were summed to yield a normative belief score. A high score represented high normative beliefs to do strength training.

Control Beliefs:

To assess control beliefs, the perceived barriers of strength training were assessed along with the perceived power of each barrier to inhibit the performance of the behaviour. To assess the barriers, participants were asked to "agree" or "disagree" with the following statement: "For me, factors that make participation in strength training difficult include....." Barriers that were assessed included: transportation to facilities, getting equipment, health problems/illness, lack of motivation, too busy/other things to do, too expensive, don't know what exercises to do, afraid of injury or over-exertion, lack of interest, little support from friends and/or family, too old, fatigue/lack of energy, weather, care-giving responsibilities, and depression. Participants were then asked about their perceived ability to overcome each of the barriers by stating "I am confident that I could do strength training even if....." Participants responded by rating themselves as "not very confident" to "very confident" on a 7 point Likert scale. Each barrier was then multiplied by the participants confidence to overcome that barrier and then responses summed to yield a control belief score. A high score represented high control beliefs to do strength training.

Participants were also asked about the number of friends that they have who participate in both aerobic and strength training. Responses were provided on a 5 point scale ranging from "all of them" to "none of them." Participants also rated their perceived health and perceived fitness on a 5 point scale ranging from "excellent" to

"poor." Demographic information such as age, gender, education, and marital status was collected using nominal categories. Finally, several open-ended questions were included to provide participants with the opportunity to give additional information which may not have been addressed in the questionnaire.

The questionnaire included a cover page which defined the terms: aerobic training and strength training. Participants were asked to refer to these definitions when responding to all of the questions on the questionnaire.

> *Aerobic exercise* was defined as activity that: increases breathing rate and heart-rate, uses large muscle groups (e.g., legs), may cause sweating or perspiration and is done for at least 30 minutes. Examples included brisk walking, swimming, cycling, dancing, and tennis.

> *Strength training* was defined as: repetitively working your muscles against moderate to heavy resistance (e.g., lifting a weight 8 to 15 times), done to improve or maintain muscular strength and/or muscular endurance, performed for all major muscle groups, and the resistance is gradually increased over time as strength improves. Examples included lifting weights, using machines or resistance tubing, and doing calisthenics (e.g., sit-ups).

Data Collection

The researcher targeted locations where large groups of older adults could be

found. As a result, it can be concluded that purposeful sampling was used. The researcher contacted the supervisors of the locations by sending them an introductory letter explaining the purpose of the study (see Appendix B), along with a copy of the questionnaire, and a description of the study. The supervisors then contacted the researcher, either by phone or email, to respond to the request. If permission was granted, the researcher then arranged a time with the supervisor to visit the facility to distribute questionnaires.

For all groups, the researcher gave a general overview of what the study was about, the time required to complete the questionnaire, and informed participants that the information they provided was confidential. Questionnaires were then distributed to those who expressed an interest in completing the questionnaire. Participants were provided with a cover letter which explained the purpose of the study, assured complete confidentiality, and informed the participants of the possibility of obtaining a copy of the final results (Appendix C). At certain locations, where time permitted, the questionnaires were completed immediately in the presence of the researcher. At other locations, where time was limited, participants were given the opportunity to take the questionnaire home to complete. In this instance, the researcher returned several days later to collect the completed questionnaires. In other instances, the questionnaires were mailed directly to the researcher. When not in a group situation, individuals were greeted and asked if they could spare 10 minutes of their time. Interested individuals were given a questionnaire and immediately returned it to the researcher upon completion.

Analysis

After the data were collected, participants were categorized into one of four groups based on self reported participation levels in strength and aerobic exercise. The four groups included, strength plus aerobic trainers, strength trainers, aerobic trainers and non-trainers.

Strength trainers (ST) were classified as those who participated in strength training activity at least two times a week.

Aerobic trainers (AT) were classified as those who do not meet the criteria for strength trainers, but participate in aerobic exercise at least three times a week.

Strength-plus-aerobic trainers (SAT) were those who met the criteria for both strength and aerobic training.

Non-trainers (NT) were those who did not meet the criteria for any of the categories.

This classification system was based on the recommendations set out by Canada's Physical Activity Guide and the American College of Sports Medicine (ACSM). Canada's Physical Activity Guide states that every individual should

accumulate 30 minutes of aerobic activity four to seven days a week, and participate in strength training two to four days a week (Health Canada). The American College of Sports Medicine states that every individual should participate in aerobic activity 3 to 5 days a week, for at least 30 to 45 minutes. It does not give specific guidelines for strength training (American College).

Frequencies were used to determine trends in the demographic variables for the total sample. Next, cross tabulation and the Chi-square test statistic were used to compare the four groups on the demographic variables and determine if any significant differences existed. When the variance between the groups was equal, ANOVAs were used to determine if differences existed between the four groups on the variables of the TPB. When variance between the four groups was not equal, the non-parametric Kruskal-Wallis H test was used along with the Chi square test statistic. Next, frequencies were used to describe the behavioural beliefs, normative beliefs, and control beliefs of the total sample. Finally, correlations and regression analysis were used to determine the predictive value of the TPB for explaining strength training behaviour in the older population.

Please note that some of the participants could not be classified into a group because of inconsistencies found in their answers when reporting participation. Only the participants, who could be clearly classified into one of the four groups, were used in the group comparisons. On the other hand, all participants, including those who were classified into a group and those who were not, were used in the regression procedure.

Results

Demographics

The sample consisted of 52 strength-plus-aerobic trainers, 27 strength trainers, 41 aerobic trainers, and 49 non-trainers (see Table 3). Thirty-one participants could not be classified into one of the four groups. The final sample consisted of 52 males (26%) and 147 females (73%), and 1 who did not indicate their gender.

Table 4 Category and Gender Breakdown of the sample

	Male	Female	**Total**
SAT	11	41	**52**
ST	7	20	**27**
AT	15	26	**41**
NT	11	38	**49**
Not Clear	8	22	**30**
Total	**52**	**147**	**199**

Age was assessed in categories ranging from 55 years to 90 plus years of age. As Figure 2 demonstrates, 50% of the sample was 70 years of age or younger and 69% of the sample was between the ages of 60 and 75 years. As a result, the sample can be described as young-old (Taylor, 2002). As Figure 3 demonstrates, 54% of participants were currently married or living common law, 34% were widowed, 8% were divorced or separated, and 4% were never married. Twenty nine percent of the sample had less than a high school education, 26.5% had a high school education, 20% had completed college or technical school, and 24.5% had completed University or earned an advanced degree.

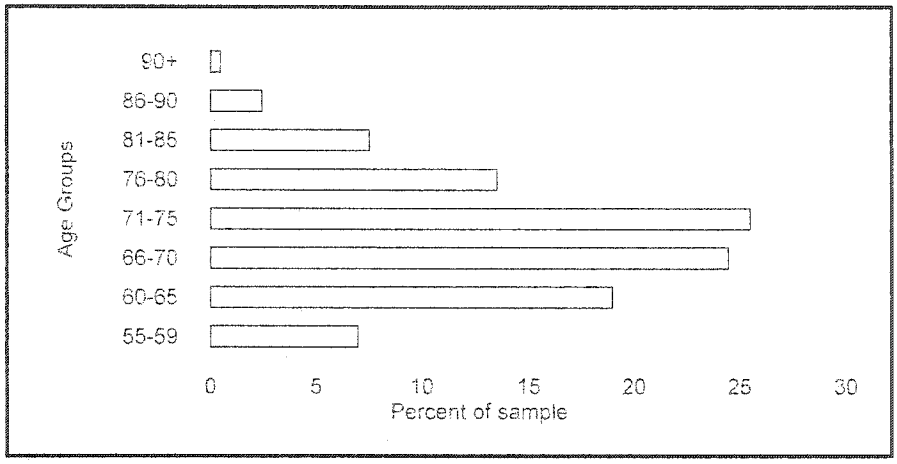

Figure 2 Age breakdown of total sample

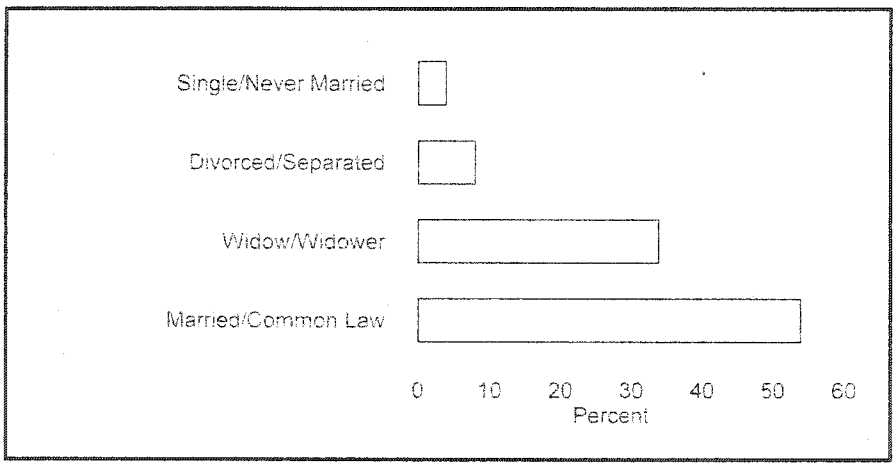

Figure 3 Marital status of total sample

The participants came from three main areas of Ontario, Canada. One hundred and seventeen participants or 61% of the sample, lived in the Thunder Bay area including, Thunder Bay, Murillo, Kakabeka Falls, and Oliver Paipoonge. Fifty-one participants or 26.5% of the sample, lived in or around Woodstock, including Ingersoll, Otterville, and Tillsonburg. Finally, 24 participants or 12.5% of the sample, lived in London.

As figure 4 demonstrates, 95% of the sample rated their *health* as "excellent", "very good" or "good", while 87% of the sample rated their *fitness* as "excellent", "very

good" or "good." When asked about the number of their friends who participate in aerobic exercise, 9% said "most of them", 22% said "half of them", 58% said "a few of them", and 11% said "none of them". When asked about the number of their friends who participate in strength training, 6% said "most of them", 9% said "half of them", 60% said "a few of them" and 24% said "none of them".

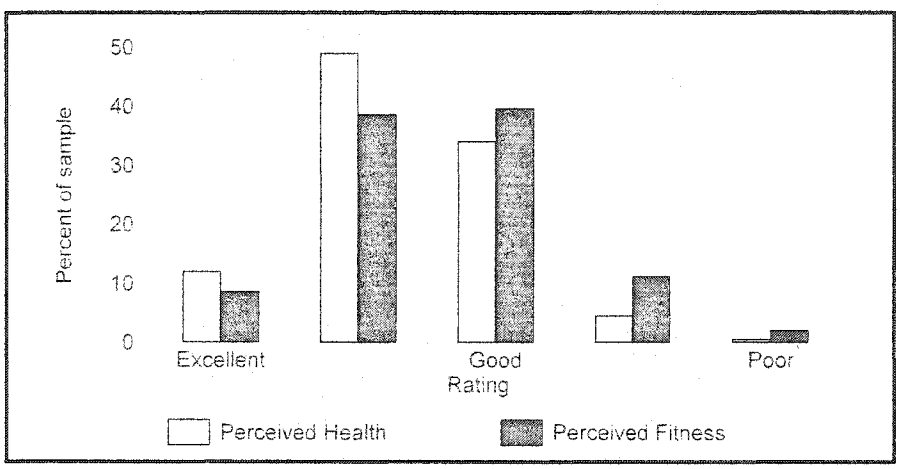

Figure 4 Perceived health and fitness of total sample

Difference between groups on demographic variables

Results revealed no significant differences between the groups on gender, age, or marital status. There was a significant difference between the four groups on education (X^2 (9) = 28.605, p< 0.01). This finding may be attributed to the differences seen between the strength trainers and the non-trainers. As Figure 5 demonstrates, 79% of the non-trainers had a high-school education or less, compared to 19% of the strength trainers. Conversely, 81% of the strength trainers completed college or university, compared to 21% of the non-trainers.

A significant difference was also found between group membership and the number of friends who participate in *aerobic training* (X^2 (9) = 25.797, p< 0.01), with the non-trainers having fewer friends who participate compared to the other three groups.

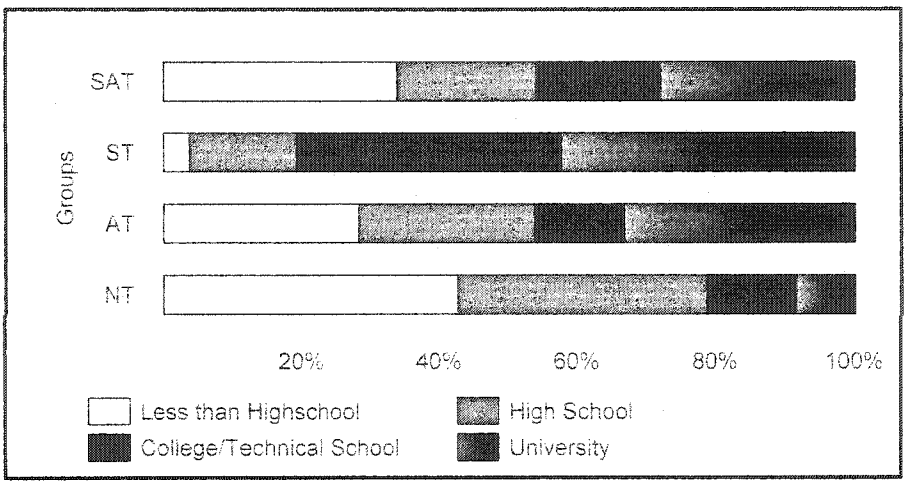

Figure 5 Education breakdown for groups

Eighty-nine percent of the non-trainers reported having "a few" to "no" friends who participate in aerobic training (67% had a few and 22% had none). The aerobic trainers had the most friends who participate in aerobic training with 15% reporting "most" of their friends participate, and 37% reporting "half" of their friends participate. There was also a significant difference between group membership and the number of friends who participate in *strength training* (X^2 (9) = 26.137, $p < 0.01$). As Figure 6 demonstrates, 98% of the non-trainers had "a few" to "no" friends who participated in strength training. The strength plus aerobic trainers had the most friends who participate, with 31% reporting that at least half of their friends participate.

There was also a significant difference between group membership and *perceived health* (X^2 (12) = 25.226, $p < 0.05$). Results revealed that 34.6% of the strength trainers rated their health as "excellent", while only 5.8% of the strength plus aerobic trainers, 5.1% of the aerobic trainers, and 8.2% of the non-trainers rated their health this way.

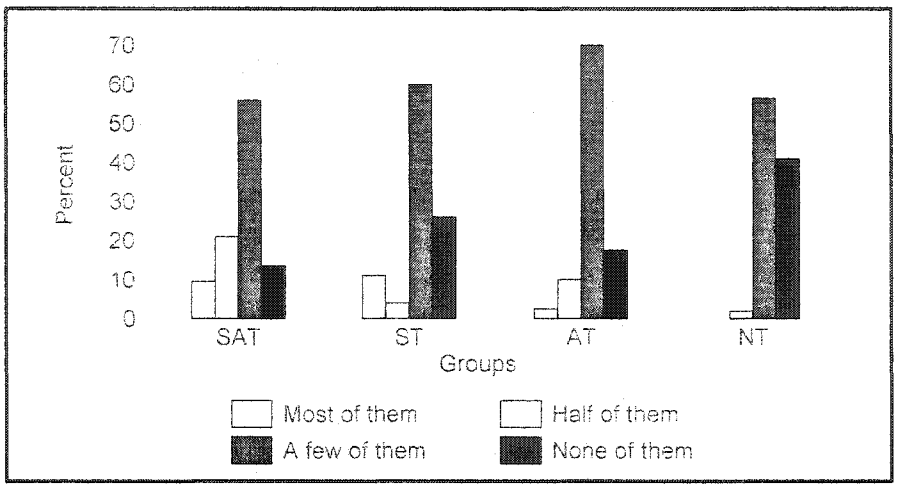

Figure 6 Number of friends who participate in strength training

There was a significant difference between group membership and *perceived fitness* (X^2 (12) = 26.810, p< 0.01). As Figure 7 demonstrates, 32% percent of non-trainers rated their fitness as "fair" to "poor". Only 9.6% of strength plus aerobic trainers, and 9.8% of aerobic trainers rated their fitness as "fair" and none rated it as "poor". No strength trainers rated their fitness less than "good". There was no significant difference between the age categories and the rating of perceived health or perceived fitness.

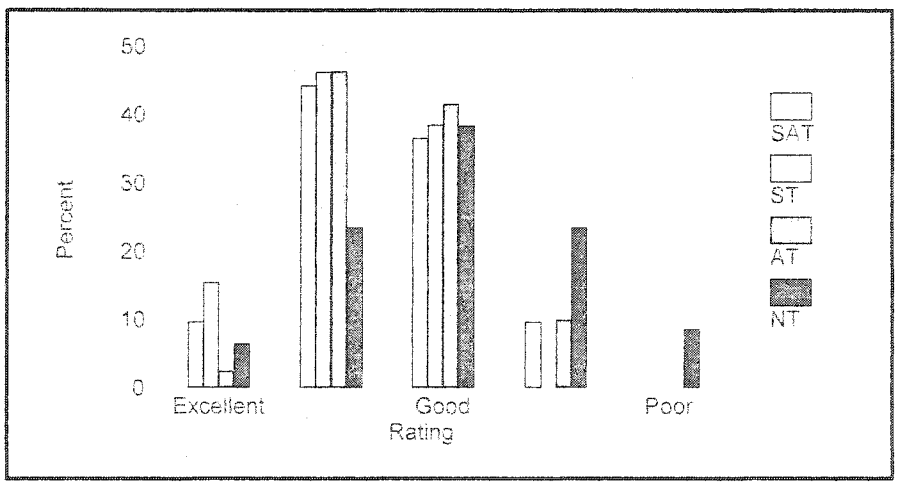

Figure 7 Perceived fitness by group

The mean rate of participation in aerobic training for the total sample was 2.6 days a week, while the median was 3 days a week. The mean rate of participation in strength training was 1.6 days a week, while the median was 2 days a week. The fact that the mean is smaller than the median, indicates that these data are negatively skewed. As a result, the non-parametric Mann-Whitney U test was used to test for differences between the groups on rates of participation. The test revealed that there was a significant difference between the SATs and STs on participation in strength training ($U = 361$, $p < 0.001$). The SATs mean rate of participation in strength training was 3 days a week, while the STs mean rate of participation was 2 days a week. The Mann-Whitney U test also revealed a significant difference between the SAT group and the AT group on rate of participation in aerobic training ($U = 812.5$, $p < 0.05$). The ATs participated an average of 4.2 days a week, while the SATs participated an average of 3.7 days a week.

Looking at the participant's past participation in strength training, results showed that 12.4% of the total sample participated in strength training under the age of 29, 28.6% participated between the ages of 30 and 59, 45.9% participated over the age of 60, and 28.6% have never participated (see Figure 8). There were no significant differences between the groups on participation under the age of 29 or participation between the ages of 30 and 59. However, significant differences were found between the groups on participation over the age of 60 (X^2 (3) = 87.276, $p < 0.001$) and never participated (X^2 (3) = 52.453, $p < 0.001$). More strength plus aerobic trainers and strength trainers participated over the age of 60 and more aerobic trainers and non trainers have never participated. Further analysis revealed that 81.4% of strength plus

aerobic trainers and 70% of strength trainers, never participated when they were younger but now participate over the age of 60. Meanwhile, 33.3% of aerobic trainers and 31.1% of non-trainers, used to participate when they were younger but do not now. Finally, 47.2% of the aerobic trainers and 53.3% of the non-trainers have never participated in strength training.

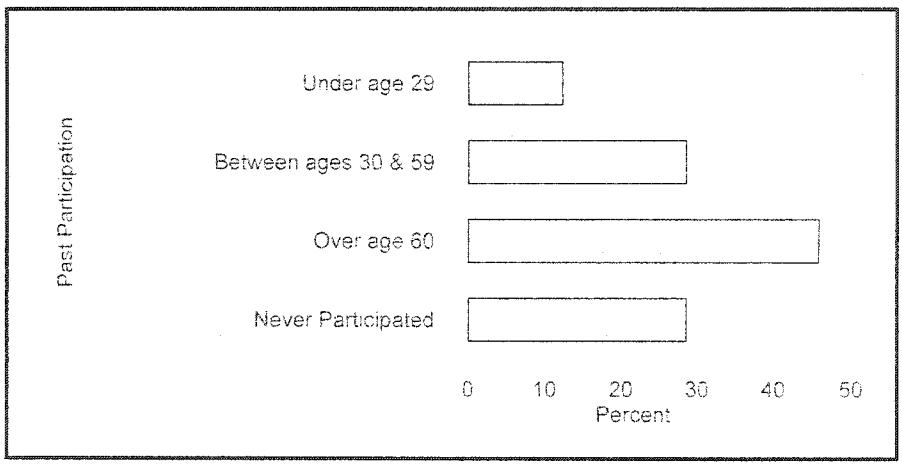

Figure 8 Past participation in strength training

Differences between groups on main constructs of TPB

Tests were conducted to assess if differences existed between the four groups on the variables of the Theory of Planned Behaviour. Significant differences were found between the four groups on *intention* to do strength training (X^2 (3) = 59.66, $p < 0.001$). Scheffe post hoc analysis revealed that both the strength plus aerobic training group and the strength training group differed significantly from the aerobic training and non-training groups ($p < 0.001$ for all comparisons). Figure 9 illustrates that the strength trainers and strength plus aerobic trainers had higher intentions to do strength training than the aerobic trainers and the non-trainers.

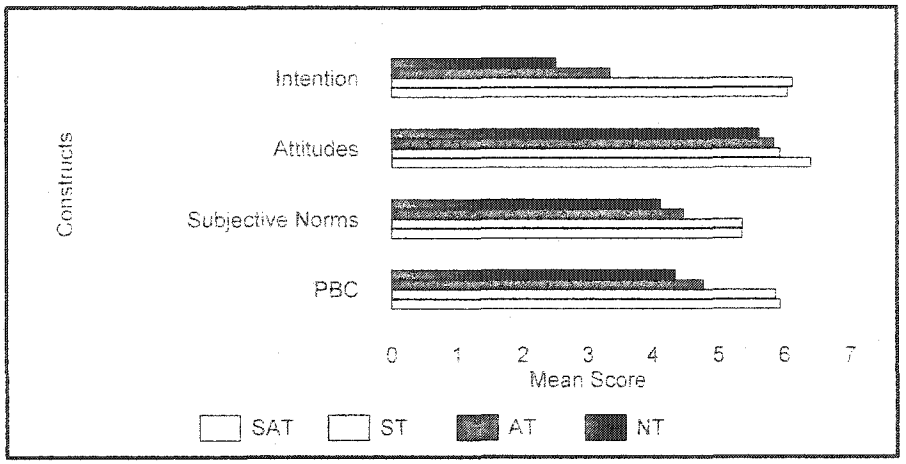

Figure 9 Group differences on main constructs
Note: Highest possible score = 7

As Table 5 demonstrates, a significant difference was found between the groups on *Subjective Norms* (X^2 (3) = 15.41, $p< 0.01$). Scheffe post hoc analysis revealed that the non-trainers differed from both the strength plus aerobic trainers ($p< 0.01$) and the strength trainers ($p< 0.05$).

Table 5 Significant differences: Intention, Subjective Norm and PBC

	Chi Square	df	Sig.
Intention	59.659	3	.000
Subjective Norm	15.141	3	.002
PBC	31.148	3	.000

Closer examination of the questions used to assess this construct, revealed more detailed information. The first question, which assessed the perception of a social expectation to do strength training, revealed a significant difference between the groups (F (3) = 7.05, $p< 0.01$). As Figure 10 illustrates, ATs and perceived significantly less

social expectation to do strength training compared to the SATs ($p< 0.05$) and the NTs perceived significantly less social expectation to do strength training compared to the SATs and STs ($p<0.01$ and $p<0.05$ respectively).

The second question, which assessed perceived social support to do strength training, also revealed a significant difference between the groups (X^2 (3) = 16.37, $p< 0.01$). As Figure 11 demonstrates, the ATs and NTs perceived less social support to do strength training compared to the SATs ($p< 0.05$ for both).

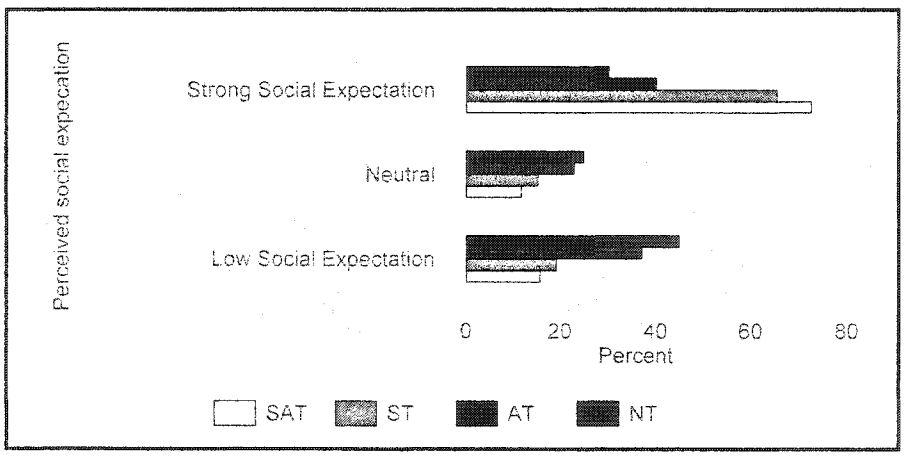

Figure 10 Perceived social expectations to do strength training

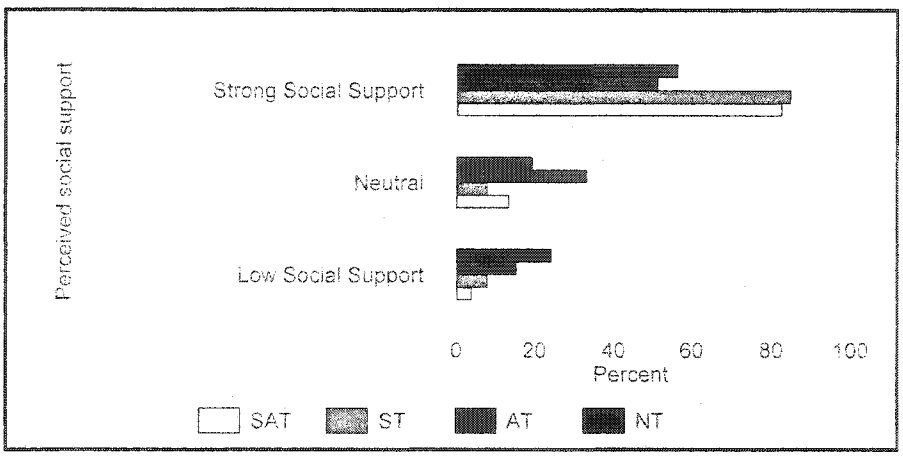

Figure 11 Perceptions of social support to do strength training

A significant difference was also found on the variable *Perceived Behavioural Control* (X^2 (3) = 31.48, p< 0.001). Scheffe post hoc analysis revealed that the NTs differed from the SATs (p< 0.001) and the STs (p< 0.01). In addition, the ATs differed from the SATs (p< 0.01) and the STs (p< 0.05). Closer examination of the questions used to assess this construct, revealed more detailed information. For example, on the question assessing perceived control to do strength training, a significant difference was found between the groups (X^2 (3) = 16.78, p< 0.01). As Figure 12 illustrates, the NTs perceived less control to do strength training than the SATs and STs (p< 0.01 and p< 0.05 respectively). On the question assessing the perceived difficulty of strength training, a significant difference was also found (X^2 (3) = 41.55, p< 0.001). As Figure 13 illustrates, the NTs perceived strength training to be more difficult compared to the SATs and STs (p< 0.001 and p< 0.05). The ATs also perceived strength training to be more difficult compared to the SATs and STs (p< 0.001 and p<0.01).

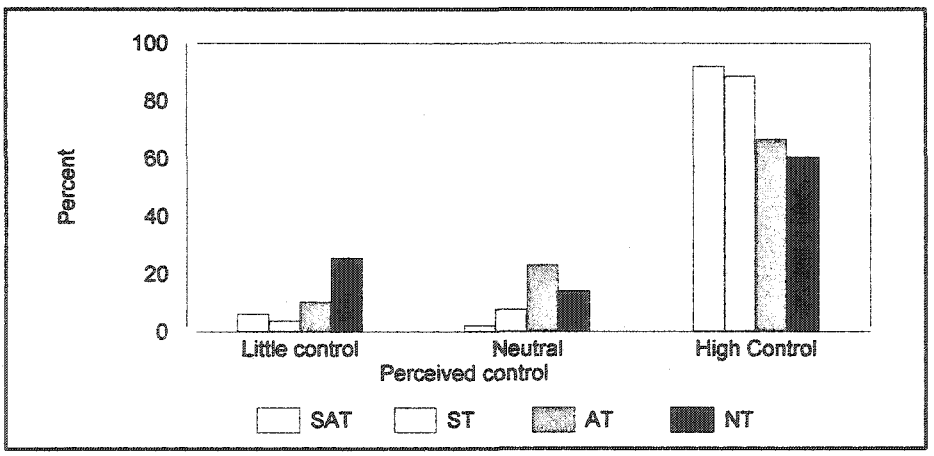

Figure 12 Perceived control to do strength training

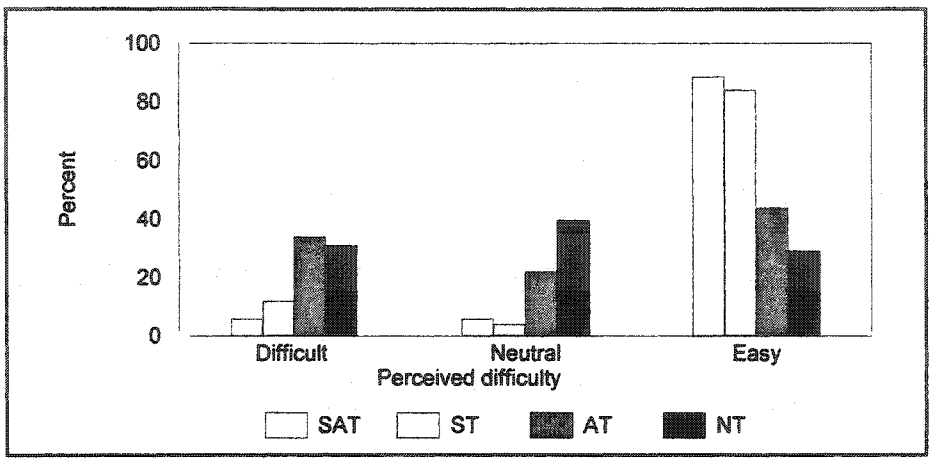

Figure 13 Perceived difficulty of participation in strength training

As Table 6 demonstrates, there was no significant difference found between the four groups on *attitude*. Note that on intention, attitude, subjective norms, and perceived behavioural control, no differences were found between the strength plus aerobic trainers and the strength trainers or between the aerobic trainers and the non-trainers.

Table 6 Analysis of Variance: Attitude

		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between	13.165	3	4.388	2.130	.100
	Within Groups	253.414	123	2.060		
	Total	266.579	126			

In summary, the findings revealed that the non-trainers could be differentiated from those who participate in strength training (both the strength plus aerobic trainers and the strength trainers) by subjective norms and perceived behavioural control.

Aerobic trainers on the other hand, could only be differentiated from those who participate in strength training (both the strength plus aerobic training group and the strength training group) by perceived behavioural control (see Figure 14).

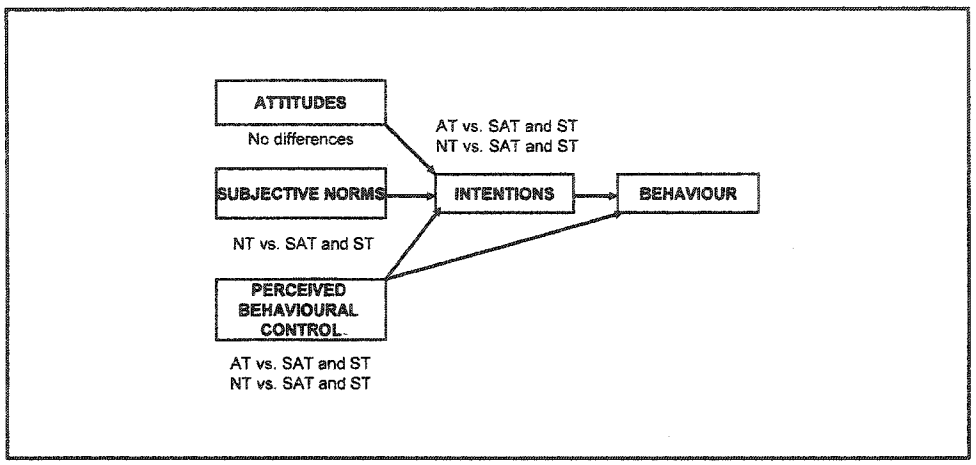

Figure 14 Differences between the groups on main TPB constructs

Differences between groups on secondary constructs of TPB

Significant differences were also found between the four groups on the secondary constructs of the Theory of Planned Behaviour (see Figure 15). Recall that *behavioural beliefs* are made up of what an individual perceives as the consequences of doing the behaviour and their personal evaluation of each of those consequences as important or not important. As Table 7 demonstrates, a significant difference was found between the groups on behavioural beliefs (X^2 (3) = 14.25, p< 0.01). Scheffe post hoc analysis, revealed a significant difference between the SATs and the ATs (p< 0.01).

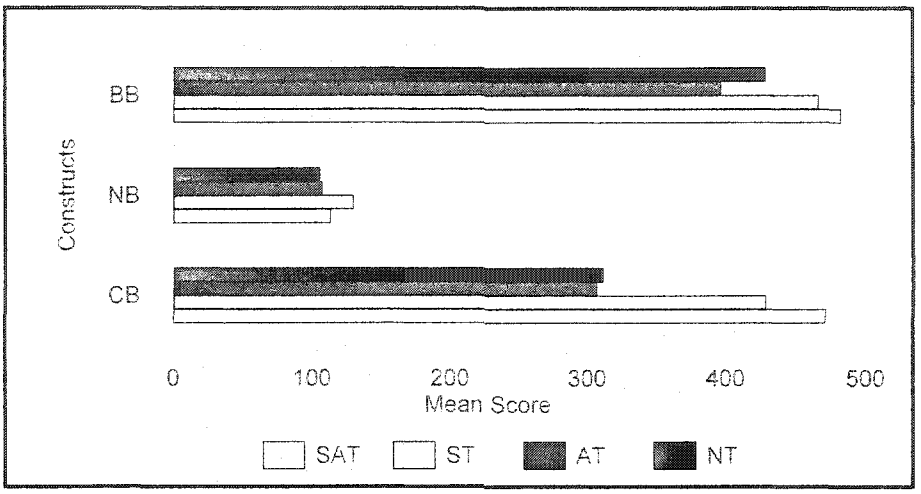

Figure 15 Group differences on secondary constructs
Note: Highest possible score for BB = 539, NB = 196, CB = 784

Table 7 Significant differences: Behavioural Belief and its components

	Chi Square	df	Sig.
Behavioural Belief	14.256	3	.003
• Benefits	13.640	3	.003
• Importance	12.157	3	.007

Closer examination of behavioural beliefs revealed a significant difference between the groups on the perception of what the benefits of strength training were (Benefits Score) (X^2 (3) = 13.64, p< 0.01). Scheffe post hoc analysis revealed that both the ATs and NTs differed from the SATs (p< 0.01 and p< 0.05 respectively). There was also a significant difference between the groups on the perception of the importance of the benefits (Importance Score) (X^2 (3) = 12.16, p< 0.01), however, only the ATs differed from the SATS on this variable (p< 0.05) (see Figure 16).

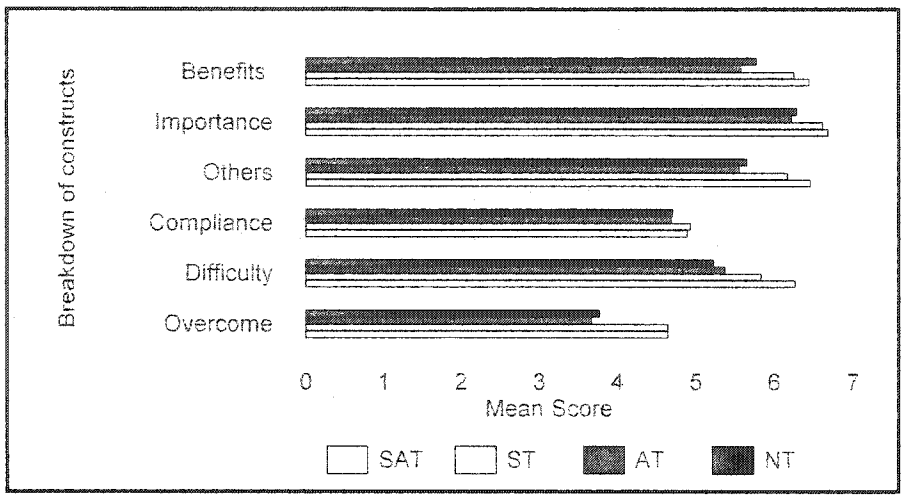

Figure 16 Breakdown of secondary constructs
Note: Highest possible score = 7

Recall that *normative beliefs* are made up of the expectations of significant others and the motivation to comply with these significant others. As Table 8 demonstrates, there were no significant differences found between the four groups on normative beliefs. However, examination of the breakdown of normative beliefs revealed a significant difference on perceived support from significant others to do strength training (Others Score) (X^2 (3) = 19.01, p< 0.001) (see Table 9). Scheffe post hoc analysis revealed a significant difference between the SATs and the ATs (p< 0.001) and NTs (p< 0.05). Specifically, there was a significant difference in perceived support from *friends* to do strength training (X^2 (3) = 5.76, p< 0.01). As Figure 17 illustrates, ATs perceived less support from their friends to do strength training compared to the SATs. There were no significant differences between the groups on the importance of significant others in influencing behaviour (Compliance Score). In other words, all the groups perceived the same significant others to be important in influencing their behaviour.

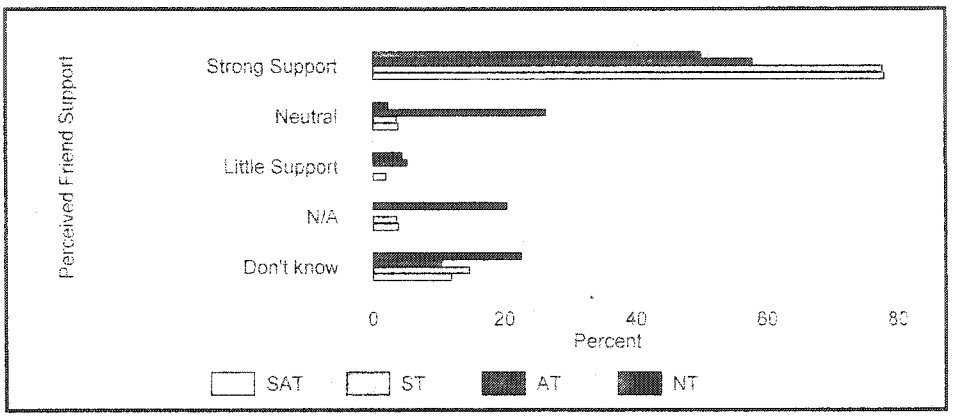

Figure 17 Perceived support from friends to do strength training

Table 8 Analysis of Variance: Normative Belief

		Sum of Squares	df	Mean Square	F	Sig.
Normative Belief	Between Groups	3855.330	3	1285.110	.520	.670
	Within Groups	131010.9	53	2471.903		
	Total	134866.2	56			
• Compliance Score	Between Groups	1.637	3	.546	.227	.878
	Within Groups	41.989	142	2.408		
	Total	343.626	145			

Table 9 Significant difference: Others score

	Chi Square	df	Sig.
• Others	19.014	3	.000

Recall that *control beliefs* are made up of the perception of obstacles to performing the behaviour, and the evaluation of the significance of those obstacles in preventing the behavoiur. As Table 10 demonstrates, a significant difference was found between the groups on control beliefs ($F(3) = 8.19$, $p < 0.001$). Scheffe post hoc analysis revealed a significant difference between the strength plus aerobic trainers and both the aerobic trainers ($p < 0.01$) and the non-trainers ($p < 0.01$). Further analysis showed a significant difference between the groups on the perception of barriers (Difficulty Score) ($F(3) = 9.67$, $p < 0.001$). Post hoc analysis revealed that both the ATs and NTs differed from the SATs ($p<0.01$ and $p < 0.001$ respectively). There was also a significant difference on the perceived ability to overcome the barriers (Overcome Score) ($F(3) = 5.22$, $p < 0.01$), with only the ATs differing from the SATs ($p < 0.05$). Note that on behavioural beliefs, normative beliefs, and control beliefs, no differences were

Table 10 Analysis of Variance: Control Belief and its components

		Sum of Squares	df	Mean Square	F	Sig.
Control Belief	Between Groups	731701.4	3	243900.46	8.193	.000
	Within Groups	3810328	128	29768.184		
	Total	4542029	131			
• Difficulty	Between Groups	29.186	3	9.729	9.667	.000
	Within Groups	147.939	147	1.006		
	Total	177.125	150			
• Overcome	Between Groups	32.607	3	10.869	5.216	.002
	Within Groups	300.048	144	2.084		
	Total	332.655	147			

found between the SATs and STs or between the ATs and NTs.

In summary, analysis revealed that the aerobic trainers could be differentiated from the strength plus aerobic training group by behavioural beliefs and control beliefs. The non-trainers could only be differentiated from the strength plus aerobic trainers on control beliefs (see Figure 18).

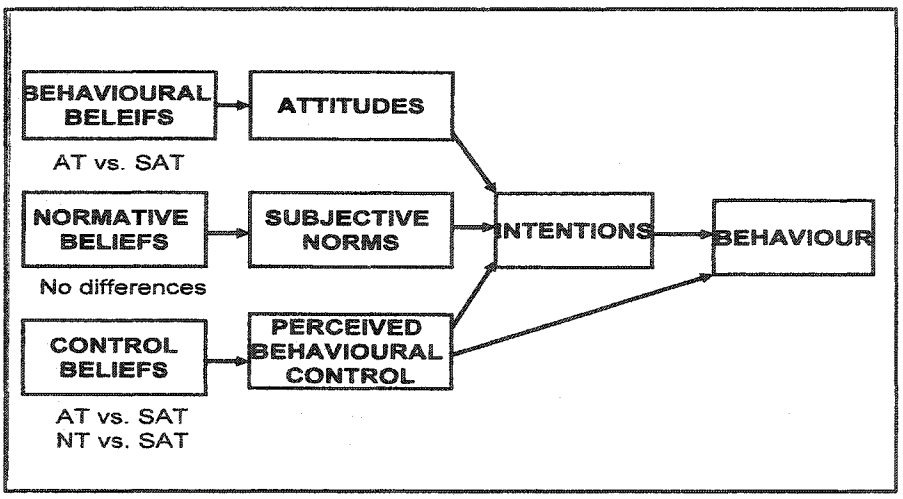

Figure 18 Group differences on secondary constructs of TPB

Descriptive statistics and the secondary constructs

Overall, the sample was well informed about the benefits of strength training. A large majority of the sample agreed with the benefits listed on the questionnaire. The benefits that received the most positive responses included improved muscle strength and tone (85.5% of the sample agreed), improved fitness (83.5% of the sample agreed), increased energy level, and improved health (82% of the sample agreed with each). The benefit that received the lowest positive response was lose/control weight, with 69% of the sample agreeing (note, this is still a large majority). The other benefits listed on the questionnaire included increase bone density (81.5% agreed), prevention

of falls (78.5% agreed), improved mood (77% agreed), relieve stress/tension (77% agreed), improved ability to do everyday tasks (80% agreed), and improved confidence to do everyday tasks (74.5% agreed).

There were significant differences between the four groups on the rating of the specific benefits. A larger percentage of SATs agreed with the benefits listed on the questionnaire compared to the other three groups. Aerobic trainers had the lowest percentage agreeing with each of the benefits listed; even fewer than the non-trainers. Aerobic trainers also had a greater percentage responding neutral when asked about the benefits. For example, 28.9% responded neutral when asked if strength training could help them improve their mood (see Figure 19).

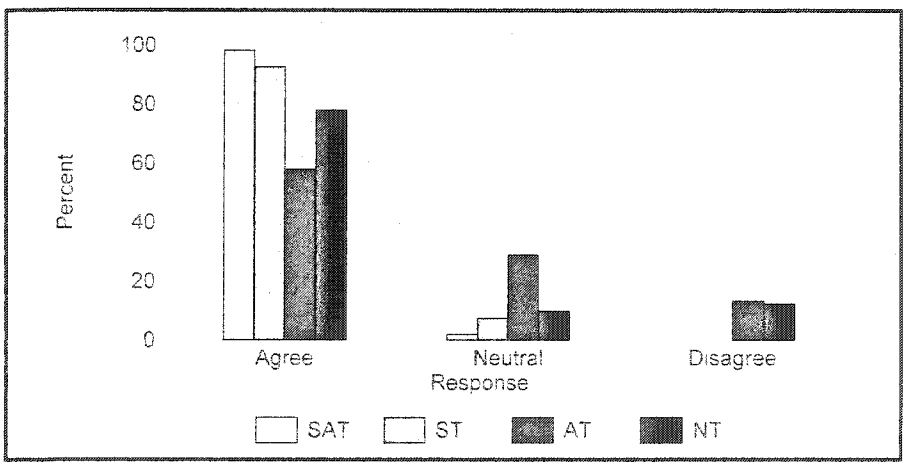

Figure 19 Strength training and improve mood

Participants were also asked about the importance of significant others in influencing their behaviour in general. Results revealed that 82% of the sample wants to do what their doctor thinks they should do, 43% want to do what their children think they should do, 35% want to do what their spouse thinks they should do, and 27.5% want to do what their friends think they should do. Taken another way, this also means that

57% do not care what their children think they should do, 65% do not care what their spouse thinks they should do, and 72.5% do not care what their friends think they should do. Specifically for strength training behaviour, 48.5% of the overall sample felt their spouse would support their participation in strength training, 66.5% felt their children would support their participation in strength training, 60% felt their friends would support their participation in strength training, and 55.5% felt their doctor would support their participation in strength training. In addition, 28% of the sample did not know if their doctor thought they should participate in strength training.

Participants were also asked about the barriers they perceived to participation in strength training (see Figure 20). Overall, "lack of motivation" and "too busy/other things to do", were the strongest barriers identified, however, only 23% of the total sample agreed. Significant differences existed between the groups on the reported barriers. On most of the barriers, the non-trainers agreed more strongly compared to the other three groups. Two exceptions were "lack of motivation" and "lack of interest", in which case more aerobic trainers agreed (55.6% and 26.3% respectively). Aerobic trainers were significantly different from the other three groups on these barriers (X^2 (6) = 39.09, p< 0.001 and X^2 (6)= 21.11, p< 0.01 respectively). For the non-trainers, the strongest barriers reported were "too busy/other things to do" and "don't know what exercises to do", with 43% agreeing. The NTs were significantly different from the other groups on these barriers (X^2 (6)= 17.51, p< 0.01 and X^2 (6)= 21.11, p< 0.01). For the strength trainers, the strongest barrier reported was "health problems", with 29.6% agreeing, however, there was no significant difference between the groups on this barrier. Strength trainers were significantly different from the other three groups on the barrier

"fatigue/lack of energy" (X^2 (6) = 16.540, p< 0.05). For the strength plus aerobic trainers, the strongest barrier reported was "getting equipment" with 16.7% agreeing, however, this difference was not statistically significant.

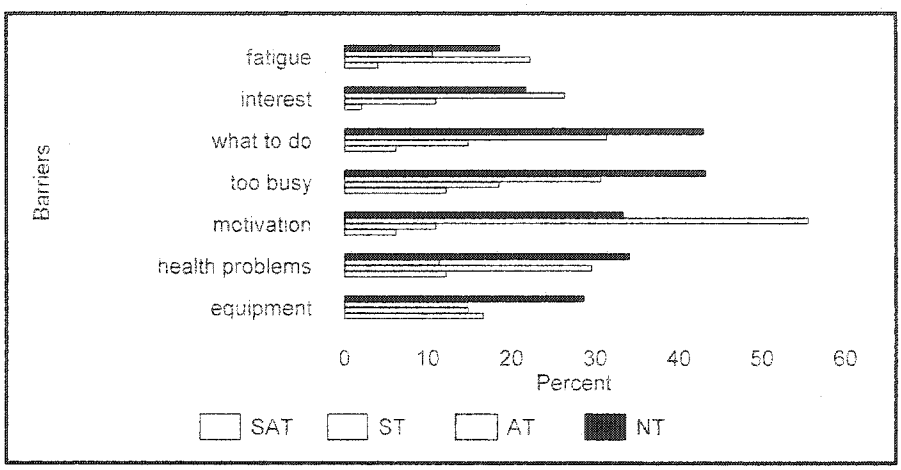

Figure 20 Barriers reported for groups

The prediction of strength training behaviour in older adults

As Table 11 demonstrates, all of the main constructs of the theory including attitudes, subjective norms, and PBC were significantly correlated to intention (0.29, 0.59 and 0.48 respectively, at p< 0.01). Intention was significantly correlated to behaviour at 0.61 (p< 0.01). PBC was also significantly correlated to behaviour at 0.35 (p< 0.01).

Regression analysis was conducted to determine if the Theory of Planned Behaviour was a useful model for predicting *intention* to do strength training in the older population. Using the forward method, the three main variables of the TPB were entered into the regression. Results revealed that subjective norm and PBC were the strongest predictors of intention, with a correlation coefficient (R) of 0.613 (F= 37.658,

Table 11 Correlations between TPB constructs

	1	2	3	4	5	6	7	8
1. Behaviour		.609**	.162	.310**	.347**	.250**	.123	.278**
2. Intention			.289**	.589**	.484**	.453**	.322*	.358**
3. Attitudes				.382**	.371**	.505**	.156	.329**
4. Subject. Norm					.463**	.549**	.537**	.337**
5. PBC						.431**	.243	.416**
6. BB							.347*	.371**
7. NB								.096
8. CB								

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

$p< 0.001$). Based on the R^2 adjusted, 37% of the variance in strength training intentions, could be explained by subjective norms and PBC (see Table 12 and 13).

Table 12 Summary of Forward Regression for Strength Training Intention

	Unstandardized Coefficient		Standardized Coefficient	t	Sig.
Model	B	Std. Error	Beta		
1 (Constant)	.749	.531		1.410	.161
subjective	.820	.105	.572	7.823	.000
2 (Constant)	-.578	.665		-.869	.386
subjective	.643	.116	.449	5.550	.000
pbc	.403	.128	.253	3.135	.002

Table 13 ANOVA for Strength Training Intention

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regresion	226.374	1	226.374	61.200	.000
Residual	466.061	126	3.699		
Total	692.436	127			
2 Regression	260.345	2	130.173	37.658	.000
Residual	432.090	125	3.457		
Total	692.436	127			

a Predictors: (Constant), subjective norm
b Predictors: (Constant), subjective norm, pbc

Regression analysis was also conducted to determine if the Theory of Planned Behaviour was a useful model for predicting strength training *behaviour* in the older population. Using the forward method, the three main variables of the TPB were entered into the regression, along with intention. Results revealed that intention was the strongest predictor of strength training behaviour, explaining 46% of the variance. The correlation coefficient (R) was 0.681 (F= 106.564, $p<0.001$) (see Table 14 and 15).

Table 14 ANOVA for Strength Training Behaviour

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regresion	142.422	1	142.422	106.56	.000
Residual	164.390	123	1.337		
Total	306.812	124			

a Predictors: (Constant), intention

Table 15 Summary of Forward Regression for Strength Training Behaviour

	Unstandardized Coefficient		Standardized Coefficient	t	Sig.
Model	B	Std. Error	Beta		
1 (Constant)	-.367	.230		-1.597	.113
intention	.455	.044	.681	10.323	.000

Discussion

Demographics and participation levels

Overall the majority of the sample was young-old and perceived themselves to be in very good health and of good fitness. Note, there were no significant differences between the age categories and the rating of perceived health or perceived fitness. As a result, the high rating of health and fitness can-not be attributed to the younger age categories represented. Results showed that significantly more strength trainers rated their health as "excellent" compared to the other three groups. As well, significantly more non-trainers rated their fitness as "fair" to "poor" compared to the other three groups. These findings support the literature described earlier, regarding the benefits of strength training.

The current activity levels of the sample as a whole, are on track with Canada's Physical Activity Guide and the guidelines set out by the ACSM. Recall, the median for days of participation in strength training was two, while the median for days of participation in aerobic training was three. The SATs were slightly more active in strength training than the ST group, yet they were slightly less active in aerobic training than the AT group. Unfortunately, the intensity of strength and aerobic training were not assessed in this study (only frequency). Assessing intensity would have provided more detailed information about the kind of activity the participants were involved in.

The NTs had the fewest number of friends involved in both strength and aerobic training. The SATs had the greatest number friends involved in strength training, while the ATs had the greatest number of friends involved in aerobic training. A discussion about the involvement of friends in strength training will be covered in more detail in the

section on normative beliefs. There was also a significant difference in the education levels between groups. The NTs had the lowest level of education and the STs had the highest level of education. This finding is consistent with previous research which has found, that individuals with higher levels of education are more physically active (Rhodes, Martin, Tauton, Rhodes, Donnelly & Elliot,1999).

Trends in past participation revealed that a large proportion of the current SATs and STs, started participating in strength training over the age of 60. This change in strength training participation in older age may suggest that ideas about older adults and physical activity are changing, in such a way to embrace more active and physical lifestyles in older age. This is contrary to the findings of Khoury-Murphy and Murphy (1992) who suggested strong age and gender stereotypes held by older women. Recall that there were no significant differences between the four groups and the age categories represented. In other words, there were not more SATs or STs in the younger age groups than in older age groups. As a result, it can not be concluded that these changing behaviours are due to cohort effects.

Understanding older adults strength training behaviour: Primary constructs

Looking at the differences that existed between the four groups on the constructs of the Theory of Planned Behaviour, insights can be made about the factors that influence older adults participation and/or non-participation in strength training. Significant differences were found between the two strength training groups (SAT and ST) and the two non-strength training groups (AT and NT) on *intention*. The two strength training groups had the highest intentions to do strength training, while the two

non-strength training groups had the lowest intentions to do strength training. This finding is consistent with the Theory of Planned Behaviour which states that intention is the main determinant of behaviour. Since the SATs and the STs are already doing the behaviour of strength training, it is expected that their intentions to do strength training will be much higher than the two groups who do not do the behaviour. The discussion of intention will continue in the section on regression.

No significant differences were found between the four groups on *attitude*. This finding is surprising since most of the studies examining exercise behaviour and the Theory of Planned Behaviour have found attitudes to be a strong determinant of intention (Godin & Kok, 1996; Bryan & Rocheleau, 2002; Van Ryn, Lytle, Kirscht, 1996). However, in the present study, all of the groups had positive attitudes toward strength training and therefore, the attitude construct could not distinguish those who participate from those who do not. The study by O'Brien Cousins (2000) also found discrepancies between attitude and behaviour. O'Brien Cousins found that although many of the older women in her study thought physical activity was a good idea, they simultaneously stated concerns and made excuses to justify why they did not have to participate. Based on these findings, it appears that other factors, such as subjective norms and/or perceived behavioural control, must be at play influencing intention.

Another surprising finding was that only the NTs were significantly different from the SAT and ST groups on *subjective norms*. Closer examination of subjective norms found that the NTs had lower perceptions of social expectation and lower perceptions of social support to do strength training. These findings may be related to the finding described earlier, that the NTs had fewer friends who participate in strength training

compared to the two strength training groups. These findings are consistent with the findings of Rhodes et al. (2001) who found social support to be a predictor of the adoption of a strength training program in older women. This information suggests that, interventions that increase older adults perceptions of social expectation and social support to do strength training activity, may be beneficial in helping more NTs to become involved.

Consistent with the hypothesis of this study, the NTs and ATs were significantly different from both strength training groups (the SATs and STs), on *perceived behavioural control*. Closer examination revealed that the NTs and ATs perceived strength training to be more difficult compared to the SATs and STs. The NTs and ATs also perceived less control over their ability to do strength training. These findings are consistent with the findings of Rhodes et al. (2001), who found self-efficacy to be an important predictor of both the adoption and maintenance of a strength training program. This information suggests that interventions may be required to help older adults increase their perceived ability to do strength training. Increased self-efficacy will not only help more individuals to become involved in strength training, but as suggested by Rhodes et al., it will also help them to stay involved.

Understanding older adults strength training behaviour: Secondary Constructs

The sample as a whole, was well informed about the benefits of strength training, as a large percentage of the sample agreed with each of the benefits listed. This was a positive finding and indicates that overall, the sample was well educated about the benefits of strength training. Despite this overall finding, a significant

difference was found between the ATs and the SATs on *behavioural beliefs.* Analysis of the factors that make up behavioural beliefs found that both the ATs and NTs were different from the SATs on the perception of what the benefits were. For example, both the ATs and NTs rated the benefits less strongly, compared to the two strength training groups. However, it was also observed that the ATs responded neutral more than any of the other groups when rating the benefits. Differences in the ATs behavioural beliefs, was also shown by the fact that they were significantly different from the SATs on the rating of the importance of the benefits. As a result, education about the benefits of strength training may be most effective, if targeted toward those who are already active in physical activity, yet do not participate in strength training. In addition, interventions that involve ATs in strength training, may help them to realize the importance of the benefits for themselves. Recall, in the study by Khoury-Murphy and Murphy (1992), at first, the women were reluctant to become involved in the strength training program. However, once they actually started to participate in the program, they soon began to realize the benefits that strength training had to offer.

Looking specifically at the benefits and how they were rated by the overall sample, "improved muscle strength and tone," "improved fitness," "increased energy level," and "improved health," received the most positive responses. These findings are consistent with the findings presented by Conn (1998) in the *exercise* study. Recall, in Conn's exercise study, health and fitness outcomes, such as "improves overall health" and "makes you feel better" predominated. However, in the physical activity study, social and mood advantages, such as "improves social life", "be with others" and "feel happier" predominated. Please note, Conn used open-ended questions to assess the

perceived benefits. Conversely, the present study listed the benefits common in the literature, and then asked participants to agree or disagree. This method was chosen in order to assess older adults' beliefs about specific benefits that strength training can provide. However, the draw back to this method is that other benefits that older adults may perceive, such as the social benefits, were not assessed.

The next variable examined was *normative belief.* There were no significant differences between the groups on normative beliefs. However, when looking at the breakdown of normative beliefs, the ATs were significantly different from the SATs on the perceived support from others to do strength training. Closer examination revealed that the ATs perceived less support from their *friends* to do strength training compared to the SATs. This finding is consistent with the finding discussed earlier, that both the ATs and NTs reported fewer friends who participate in strength training compared to the two strength training groups.

Overall, physicians stood out as the most important person influencing older adults behaviour. This finding is consistent with Conn (1998) who found physician support to be the most important in influencing exercise behaviour. Unfortunately, 28% of participants were unsure if their physician thought they should participate in strength training. These findings suggest that greater emphasis should to be placed on the role of doctors in the promotion of strength training to older adults.

Another finding was that a large proportion of the sample did not feel motivated to do what their children, spouse, or friends thought they should do. For example, 65% of the sample did not care what their spouse thought they should do and 72.5% did not care what their friends thought they should do. Unfortunately, this finding seems

contradictory to the other findings of this study, highlighting the influence that significant others play in determining a person's intention to perform a behaviour. Overall, it is clear that more research is needed in order to gain a better understanding of the role of social expectation and social support, in older adults participation in strength training.

The final variable examined was *control belief*. A significant difference was found between the SATs and the ATs and NTs on control beliefs. Analysis of the factors that make up control beliefs revealed that both the ATs and the NTs were different from the SATs on the perception of what the barriers were. Further analysis revealed the barriers that presented themselves more strongly for each group. For example, the strongest barriers reported for the NTs were "too busy/other things to do" and "don't know what exercises to do". On the other hand, the strongest barriers for the ATs were "lack of motivation" and "lack of interest". The fact that different groups reported different barriers more strongly, demonstrates that different factors influence participation in strength training depending on current level of involvement in physical activity. The results of this study are consistent with the *exercise* study by Conn (1998), where health problems and time constraints were listed as the strongest barriers. On the second component of control beliefs, only the ATs were different from the SATs on perceived ability to overcome the barriers. As a result, interventions may need to focus specifically on developing coping strategies to help ATs overcome the barriers they perceive.

Predicting older adults strength training intentions

The correlations found between intention and the TPB constructs, including

attitude, subjective norm, and PBC were 0.29, 0.59 and 0.48, respectively. Recall, in the meta analysis by Godin and Kok, looking at general exercise, attitude and perceived behavioural control were equally correlated to intention (0.51 and 0.50 respectively), while subjective norms exhibited a smaller correlation of 0.30. In the Bryan and Rocheleau study, looking at strength training in a younger population, perceived behavioural control was most highly correlated to intentions (0.79), followed by attitudes (0.56), and then subjective norms (0.44). Since no other studies have examined the TPB constructs in the context of strength training behaviour in the older population, it was expected that the relationships between variables in this study would be unique. For example, the correlation found between attitude and intention was slightly lower than the correlations found in the other studies reviewed. On the other hand, the correlation between subjective norm and intention was slightly higher compared to the other studies reviewed. The correlation between PBC and intention was consistent with the other studies reviewed, with the exception of the Bryan and Rocheleau (2002) study. Their study found a very high correlation between PBC and intention of 0.79. From this information, it appears that attitude may play a smaller role in influencing strength training intention in the older population, compared to strength training in the younger population and general exercise intention. It also appears that subjective norms play a stronger role in influencing strength training intention in the older population, compared to strength training in the younger population and general exercise intention. The role of perceived behavioural control appears to be similar in both older adults strength training intention and general exercise intention, however, it may play a stronger role in younger adults strength training intention; as demonstrated

Bryan and Rocheleau.

Regression analysis revealed that subjective norm and PBC were significant predictors of intention, accounting for 37% of the variance. These findings are unique, since no other studies reviewed, found this combination of variables to be the most predictive. The results are also different from the hypothesis that attitudes and PBC would be the strongest predictors of intention. This level of prediction is low compared to the findings of Bryan and Rocheleau, who were able to account for 67% of the variance in intentions. The reason for the difference can likely be attributed to the strong influence of PBC found in the Bryan and Rocheleau study. Overall, these findings are consistent with the findings of Rhodes et al. (2001) who found social support and self-efficacy to be predictors of the adoption of a strength training program. Rhodes et al. also found that participation at 3 months and self-efficacy were predictors of adherence to the program at 6 months. Unfortunately, the method used to assess past participation in the present study was not useful in the regression analysis, and therefore, its predictive value was not assessed.

Predicting older adults strength training behaviour

In the present study, intention and PBC were significantly correlated to behaviour at 0.61 and 0.35 respectively. The correlation between intention and behaviour is slightly higher than the correlations found in the general exercise literature. A similar correlation of 0.59 was found in the Bryan and Rocheleau study of strength training, however, in that study, PBC actually played a larger role in the prediction of behaviour than intention (0.61 for PBC versus 0.59 for intention).

Regression analysis revealed that intention was the strongest predictor of strength training behaviour, accounting for 46% of the variance. This level of prediction is slightly higher than the results found in the studies reviewed. In the meta-analysis of general exercise behaviour, by Godin and Kok (1996), intention accounted for 36% of the variance in behaviour. In the Bryan and Rocheleau (2002) study, both intention and PBC accounted for 40% of the variance in strength training behaviour. The present study did not find PBC to be a direct predictor of behaviour. Since the present study is the first of its kind, additional research is required to confirm the results.

Conclusions

Overall, the results of this study support the researcher's hypothesis that the SATs and STs would score higher on the constructs of the TPB compared to the ATs and NTs. In other words, those who participate in strength training have higher attitudes, subjective norms, perceived behavioural control, behavioural beliefs, normative beliefs, and control beliefs to do strength training, compared to those who do not participate in the activity. However, contrary to the hypothesis, the differences between the four groups were not always significant; as in the case of attitude and normative beliefs. As well, contrary to the hypothesis, the ATs did not always score higher on the constructs compared to the NTs. In fact, there were no statistically significant differences between these two groups on any of the variables. The researcher did not expect to find that only the SAT group would differ from the ATs on behavioural beliefs, or the ATs and NTs on control beliefs. It was also not expected that only the NTs would be different from the SATs and STs on subjective norms. Although

there were no statistical differences between the SATs and the STs, or between the ATs and NTs, research should continue to examine the uniqueness of the SAT group, as well as the similarities and differences between the ATs and NTs. Understanding the characteristics of each of these groups will provide better insight into the factors influencing older adults participation and/or non-participation in strength training.

Future research should also examine the terms that older adults use to describe their physical activity. For example, it is not known what connotation's older adults associate with the terms *weight training* versus *strength training* versus *resistance training*. For example, in a study by Ory, Kinney Hoffman, Hawkins, Sanner and Mockenhaupt (2003) focus groups suggested using terms such as "active" and "physical activity" instead of "exercise" and "fitness," because it makes the activity seem less like work. Aronson and Oman (2004) on the other hand, found that older adults perceive "physical activity" to be harder than "exercise." These studies illustrate the importance of understanding the words that older adults use to describe their activity, as different terms mean different things to different groups.

In summary, the purpose of this study was to gain a better understanding of the factors that influence older adults participation and/or non-participation in strength training. The results of this study revealed that the NTs differed from both the SATs and STs on subjective norms and perceived behavioural control and differed from the SATs on control beliefs. NTs also reported fewer friends who participate in strength training, less perceived social expectation to do strength training, and less social support to do strength training, especially from their friends. As a result, interventions that focus on increasing social expectations and social support, may be effective at increasing older

adults' participation in strength training, especially in those who are currently inactive. Interventions may also help these individuals to increase their self-efficacy to do strength training and help them to develop coping strategies to overcome the barriers they perceive.

Aerobic trainers, could be distinguished from the SATs and STs on perceived behavioural control, and the SATs on behavioural beliefs and control beliefs. As a result, interventions that focus on increasing self-efficacy to do strength training, may be beneficial in helping more aerobic trainers involved in strength training. Education about the benefits of strength training may also be beneficial to aerobic trainers, as well as hands on experience with the activity so that they can realize the importance of the benefits. Finally, interventions that identify the barriers and help individuals to develop coping strategies to overcome them, may be beneficial in getting more aerobic trainers involved in strength training.

Another purpose of this study was to determine if the Theory of Planned Behaviour is a useful model for predicting strength training behaviour in the older population. Results were not consistent with the researchers hypotheses that attitudes and PBC would be the strongest predictors of intention. However, since no other studies have used the Theory of Planned Behaviour to examine strength training behaviour in the older population, hypotheses were difficult to formulate. The prediction of both intention and behaviour was moderate (37% and 46% respectively). Based on the findings of Bryan and Rocheleau (2002), it appears that the TPB may be a better predictor of strength training intention in younger adults (67% explained variance). Unfortunately, the influence of past participation on strength training behaviour was not

examined in this study. Overall, it can be concluded that the TPB is moderately useful in predicting strength training behaviour in the older population, however, more research is needed to validate these results.

In conclusion, this research is important in helping to determine the priorities and goals for public health initiatives designed to increase older adults' participation in strength training. Since both the ANOVAs and the regression analysis uncovered similar critical variables, it can be concluded that subjective norms and perceived behavioural control are key factors discriminating older adults who participate in strength training versus those who do not. These findings are consistent with the research by Rhodes et al. (2001) highlighting the importance of social support and self-efficacy in predicting participation in a strength training program. Overall areas for improvement/intervention in the promotion of strength training behaviour in the older population include: increasing the subjective norms for NTs to do strength training, increasing the role of doctors in the promotion strength training within the older population, educating ATs about the benefits of strength training and getting them involved so they can experience the benefits, and finally, continuing to identify barriers and develop coping strategies to help older adults overcome the barriers they perceive. Implementation of these suggestions will help lead to a healthier, stronger, and more independent older population.

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Appendix A:
Strength Training Questionnaire

Lakehead
UNIVERSITY

School of Kinesiology

Tel. (807) 343-8544
Fax (807) 343-8944

Strength Training Questionnaire

Thank you for taking the time to participate in this study.

The following questionnaire will take approximately 10 to 15 minutes to complete and will ask you about ***your attitudes and beliefs toward formal strength training***.

Remember, even if you do not currently participate in this activity, the information you provide will be extremely valuable.

In this study **aerobic training** is defined as:

- activity that increases breathing rate and heart rate
- uses large muscle groups (eg. legs)
- may cause sweating or perspiration
- done for at least 30 minutes
- examples: brisk walking, swimming, cycling, dancing, tennis

As well, in this study **strength training** is defined as:

- repetitively working your muscles against moderate to heavy resistance (eg. lifting a weight 8 to 15 times)
- done to improve or maintain muscular strength and/or muscular endurance
- performed for all major muscle groups
- resistance is gradually increased over time as strength improves
- examples: lifting weights, using weight machines or resistance tubing or doing calisthenics (eg. sit ups)

If you have any questions about these definitions, please ask the researcher.

Please refer to these definitions when responding to the following questions.

For each question please circle the appropriate word or number that applies to you.

Also, please feel free to add any additional comments you feel are appropriate.

955 Oliver Road Thunder Bay Ontario Canada P7B 5E1 www.lakeheadu.ca

Strength Training Questionnaire

PART A: Please provide a bit of information about yourself (Check the appropriate box)

1. Gender:

- ☐ Male
- ☐ Female

2. Age:

- ☐ 60-65 years
- ☐ 66-70 years
- ☐ 71-75 years
- ☐ 76-80 years
- ☐ 81-85 years
- ☐ 86-90 years
- ☐ 90 years+

3. Marital Status:

- ☐ Currently married/ living common law
- ☐ Widow or widower
- ☐ Single never married
- ☐ Separated or divorced

4. Education Completed:

- ☐ No formal schooling
- ☐ Grade 1 -6
- ☐ Grade 7-11
- ☐ Completed High school
- ☐ College/Technical school
- ☐ University/Undergraduate
- ☐ Masters
- ☐ PhD
- ☐ Apprenticeship

Please circle the most appropriate response for each statement.

5. Compared to other people my age, I would say my health is:

Excellent Very Good Good Fair Poor

6. Compared to other people my age, I would say my physical fitness is:

Excellent Very Good Good Fair Poor

7. How many of your friends take part in regular aerobic exercise?

All of them Most of them Half of them A few of them None of them

8. How many of your friends take part in regular strength training?

All of them Most of them Half of them A few of them None of them

PART C: Your Attitudes and Beliefs Toward Strength Training

17. In your opinion, what steps could be taken to increase the number of older adults participating in strength training?

I believe strength training 2 to 3 times a week during the next 3 months would be: (Circle Number)

18.	Useless	1	2	3	4	5	6	7	Useful
19.	Harmful	1	2	3	4	5	6	7	Beneficial.
20.	Foolish	1	2	3	4	5	6	7	Wise
21.	Unenjoyable	1	2	3	4	5	6	7	Enjoyable
22.	Unhealthy	1	2	3	4	5	6	7	Healthy

		Strongly Disagree						Strongly Agree
23.	Most people who are important to me think I should strength train	1	2	3	4	5	6	7
24.	Most people who are important to me would/ do support my participation in strength training	1	2	3	4	5	6	7
25.	Generally speaking, I want to do what most people who are important to me think I should do	1	2	3	4	5	6	7
26.	If I chose to, I could strength train any time I wanted to	1	2	3	4	5	6	7

27. Overall, for me to engage in strength training would be: (Circle Number)

Extremely Difficult 1 2 3 4 5 6 7 Extremely Easy

		Strongly Disagree						Strongly Agree	
51.	Generally speaking, I want to do what my spouse/partner thinks I should do	1	2	3	4	5	6	7	N/A
52.	Generally speaking, I want to do what my children think I should do	1	2	3	4	5	6	7	N/A
53.	Generally speaking, I want to do what my friends think I should do	1	2	3	4	5	6	7	N/A
54.	Generally speaking, I want to do what my doctor thinks I should do	1	2	3	4	5	6	7	N/A

		Strongly Disagree						Strongly Agree		
55.	My spouse/partner would/does support my participation in strength training	1	2	3	4	5	6	7	N/A	don't know
56.	My children would/do support my participation in strength training	1	2	3	4	5	6	7	N/A	don't know
57.	My friends would/do support my participation in strength training	1	2	3	4	5	6	7	N/A	don't know
58.	My doctor thinks I should participate in strength training	1	2	3	4	5	6	7	N/A	don't know

For me, factors that make participation in strength training <u>difficult</u> include:		Strongly Disagree						Strongly Agree
59.	Transportation to facilities	1	2	3	4	5	6	7
60.	Getting equipment	1	2	3	4	5	6	7
61.	Health problems/illness	1	2	3	4	5	6	7
62.	Lack of motivation	1	2	3	4	5	6	7
63.	Too busy/other things to do	1	2	3	4	5	6	7
64.	Too expensive	1	2	3	4	5	6	7
65.	Don't know what exercises to do	1	2	3	4	5	6	7
66.	Afraid of injury or over-exertion	1	2	3	4	5	6	7
67.	Lack of interest	1	2	3	4	5	6	7

Appendix B:
Letter to supervisors

Lakehead
UNIVERSITY

School of Kinesiology

Tel. (807) 343-8544
Fax (807) 343-8944

DATE

INSERT ADDRESS
OF ORGANIZATION

Dear INSERT NAME OF SUPERVISOR,

My name is Rachel Dean and I am a Masters of Kinesiology student, with specialization in Gerontology at Lakehead University. I am writing to ask permission to visit INSERT NAME OF ORGANIZATION for the purpose of collecting data for my Masters thesis.

The topic of my thesis is "Using the Theory of Planned Behaviour to Understand Strength Training Behaviour in Older Adults." The purpose of the study is to gain a better understanding of why older adults do or do not participate in strength training. Three groups of older adults will be surveyed including those who currently participate in strength training, those who participate in only aerobic training and those who do not participate in any structured physical activity. The factors which influence older adults participation and/or non-participation in strength training activity are not well understood. As a result, the findings of this research will be beneficial in the development of interventions designed to help more individuals become involved in this activity.

I have included a copy of the questionnaire and a brief description of the study with this letter. Please contact me at 807-577-7151 or email me at rndean@lakeheadu.ca to discuss this request further. Thank you for your time and consideration.

Sincerely,

Rachel Dean
B.A, Kinesiology, CK

Appendix C:
Letter to participants

Lakehead
UNIVERSITY

School of Kinesiology

Tel. (807) 343-8544
Fax (807) 343-8944

March, 2004

Dear Participant,

My name is Rachel Dean and I am a Masters of Kinesiology student with specialization in Gerontology at Lakehead University. For my Masters thesis, I am conducting a study on the attitudes and beliefs of older adults toward strength training. The study is titled: "Using the Theory of Planned Behaviour to Understand Strength Training Behaviour in Older Adults." I am not only seeking participants who participate in strength training but also those who participate in aerobic training and those who participate in no structured physical activity. The purpose of this study is to gain an understanding of why individuals do or do not participate in strength training. This topic has not been extensively researched with older adults. As a result, the information you provide will be very useful in developing programs to help more individuals become involved in this activity.

For this study you will be asked to complete a questionnaire which should take approximately 10 to 15 minutes. The questions on the survey will ask you about your current physical activity participation and assess your attitudes and beliefs toward strength training. Remember, even if you do not currently participate in this activity, the information you provide will be extremely valuable.

The results of this study will be used for the purpose of my masters thesis and the information you provide will remain completely confidential. You will not be asked to provide your name, however, other demographic information will be requested. The data collected will be safely stored for a seven year period at Lakehead University. You are free to withdraw from participation in this study at any time.

If you have any questions or concerns regarding this study, please contact me at 807-577-7151 or my advisor Dr. Joey Farrell at 807-346-7754. The findings of this study will be available to you, at your request, upon completion of the project.

Thank you for taking the time to complete this survey and assist in this exciting research endeavour.

Sincerely,

Rachel Dean
B.A, Kinesiology, CK