Effect of exercise and the exercise setting on older women's self-concept

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EFFECT OF EXERCISE AND THE EXERCISE SETTING ON OLDER WOMEN'S SELF-CONCEPT

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A thesis submitted to the Faculty of Medicine,

Health and Sports Science, University of New South Wales,

in fulfilment of the requirements for the degree of Doctor of Philosophy

October, 2005

I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person or substantial portions of material which have been accepted for the award of any other degree or diploma at UNSW or any other educational institution, except where due acknowledgement is made in the thesis. Any contribution made to the research by others, with whom I have worked at UNSW or elsewhere, is explicitly acknowledged in the thesis. I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from my supervisor in the project's style and linguistic expression is acknowledged.

_____

Nancy Margaret Dickman

Date _____

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Abstract

This thesis investigated the effect of exercise and the exercise setting on self-concept in the context of older women. Very little research in this area has focused on older women. At the same time it attempted to identify possible mechanisms underpinning exercise-induced change in self-concept, including the effect of the group and change in real and perceived body condition and real and perceived fitness. Adherence issues and the hierarchical structure of self-concept were examined in an exploratory manner. An extensive literature review was undertaken. It concluded with a preliminary exercise-self-concept model which would be used to explain and evaluate the thesis' hypotheses. Two studies were undertaken.

Study 1 validated the English version of the Self-perception in Exercise Questionnaire (SPEQ) (Sorensen, 1999) and examined relationships between exercise status, age, body size, and physical self-perceptions in a sample of older Australian women. The SPEQ was found to be a valid and reliable instrument to be used in Study 2 to measure self-perceptions relevant to exercise in older Australian women.

Study 2, a randomised controlled trial, examined the effect of exercise and the exercise setting on older women's self-concept. It comprises the main body of work for this thesis. It compared a group of older women exercising together in a group to a similar group of women who performed exactly the same exercise alone. Then both groups were compared to a similarly motivated group of women who did not exercise, but were waiting to start an exercise program. Using a pre-posttest design it measured exercise-induced change in self-concept, self-perceptions, satisfaction, and 13 physiological measures. Following a 12-week exercise treatment, the older women who walked regularly either alone or in a group thrice weekly experienced significantly improved total, physical, and social self-concept, more positive perceptions of their body and fitness, increased satisfaction with self and with life in general,

and improved aerobic fitness compared to controls. When the three experimental conditions were compared, however, these outcomes were significant only for group exercise compared to controls; not for alone exercise compared to controls. Of greater importance, when the two exercise settings, walk alone and walk in a group, were compared, the women who walked in a group experienced significantly improved physical self-concept, satisfaction with life, and more positive perceptions of their body and fitness compared to the women who walked alone. Unexpectedly, aerobic fitness also increased significantly for the women who walked in a group relative to controls, but not for the alone walk condition. Taken together these findings suggest group exercise offers considerable psychological and aerobic fitness benefits to older women. These are valuable and unique findings. They are reinforced by the high adherence (91%) and participation rates (95%) achieved in the walk trial. Partial support was found for the proposed exercise-self-concept model and the hierarchical structure of self-concept was demonstrated. Perceived change accounted for more of the variance in self-concept than real body and fitness change. Effect sizes were larger for certain physical self-perceptions than for global self-concept.

In conclusion, this thesis has extended current knowledge of exercise effects on self-concept to older women, added a systematic exercise-self-concept review, added a useful instrument for measuring older women's self-perceptions in exercise in future studies, and added to current knowledge of mechanisms underpinning improved self-concept following exercise. Exercise, moderate-intensity walking, was found to positively and significantly affect older women's self-concept. The exercise setting differentially affected older women's self-concept; effects were significantly greater when the exercise was performed in a group with similar others. The group exercise setting and its effect on self-perceptions is suggested as a possible mechanism underpinning the positive exercise-self-concept association.

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CHAPTER ONE: INTRODUCTION

1.1 Rationale: Statement of the Problem

The positive role exercise can play in promoting physical wellbeing has received a great deal of attention over the last two decades. Recent public health policy reports such as the US Surgeon General's Report (1996) and Getting Australia Active II (2004), urge all people to be active on a regular basis. Although the physical benefits of exercise are well documented and promoted, evidence for a similar relationship between exercise and psychological benefits is less clear. Research on the effect of exercise on a range of psychological variables has reported mixed findings (Dishman, 1986; Dunn, Trevidi & O'Neal, 2001; Hughes, 1984; Landers, 2002). An exception is the area of self-concept.

Experimental results consistently indicate exercise has a positive effect on self-concept (e.g., Folkins & Sime, 1981; Gleser & Mendelberg, 1990; Gruber, 1986; Hughes, 1984; McDonald & Hodgson, 1991; Scully, Kremer, Mead, Graham & Dudgeon, 1998; Spence & Poon, 1997). This is an important finding. Self-concept is recognised as a psychological variable indicative of psychological well-being (Alfermann & Stoll, 2000; Chanal, Marsh, & Bois, 2005; Gergen, 1971; Rogers,1950) and both emotional and life adjustment (Epstein, 1973; Greenwald, 1988; Marsh, 1993; McAuley, 1994; McGuire & Padawer-Singer, 1976; Sonstroem & Potts, 1998). Self-concept is also recognized a major behavior moderator, and is frequently recognised as a mediating variable in the attainment of other desirable outcomes such as social competence (Markus & Wurf, 1987), exercise adherence (Sonstroem, 1974), and physical fitness (Marsh, 2001).

However the primary mechanisms underlying the positive relationship between exercise and self-concept remain poorly understood (e.g., Gleser & Mendleberg, 1990; Scully et al., 1998). Research in this area has mainly been descriptive and atheoretical. It

has established that self-concept improves following exercise, and further, that this improvement occurs with or without improved levels of fitness, suggesting something other than the exercise itself is having an effect. Why this occurs, however, has not been fully explored. Although a number of physiological (improved fitness, mono-amine, endorphin, thermogenic, opponent-process) and cognitive (time-out, expectancy, self-efficacy) hypotheses have received some research attention it is currently not known why or in what manner exercise positively affects self-concept.

A factor overlooked to date is the effect of the group itself. This is surprising, because consensus exists amongst theorists that the self is socially constructed (Harter, 1999; Hattie, 1992; Hoyle, Kernis, Leary, & Baldwin, 1999). Exercise research by its very nature, has consistently studied groups of individuals exercising together yet, only one published study to date (King, Taylor, & Haskell, 1993) has examined the effect of the group exercise setting on self-concept in non-clinical samples. It is generally agreed self-concept is multidimensional and hierarchically structured with sub-domains, including physical self-concept, contributing to global self-concept. Exercise performed in a group may differentially affect certain physical self-percepts which may in turn affect physical self-concept, then global self-concept.

Of additional concern are the methodological inadequacies found in the exercise self-concept literature. Many early studies, pre 1985, using a range of psychological measures, failed to detail fitness measures and exercise treatments used and fitness outcomes were often not reported. In addition many studies involved convenience samples of students or special groups such as delinquents and alcoholics often with small sample sizes, making replication and generalising difficult or impossible (Gleser & Mendelberg, 1990). Post 1990 has seen an encouraging increase in the number of more rigorous trials

in this area using samples of volunteers from the general population rather than convenience samples of school children and university students. However, more well-designed studies aimed at understanding how self-concept and exercise interact are needed to enable health professionals and policy makers to make recommendations concerning the psychological benefits of exercise. Specific psycho-beneficial guidelines concerning exercise prescription are currently lacking, or given cursory reference in international public health policy documents (Scully et al., 1998). This reflects a paucity of sound scientific research in this area. A stronger evidence base is currently needed.

A concern for theorists and researchers attempting to explain self-concept change is a paucity of research focusing on specific aspects of self-concept (e.g., Fox & Corbin, 1989). Reliance on global measures alone may negate finding evidence of change. Whereas change in global self-concept may be small or non-significant change may be greater for certain physical self-percepts such as body perceptions which would be expected to be more amenable to change following, and/or during, exercise (Sonstroem & Morgan, 1989). According to Fox (2000) physical self-perceptions may carry mental health benefits in their own right and should be used as key targets for health promotion. There is also a need to measure the process of change in physical self-perceptions during exercise treatments, an area currently largely unexplored (McAuley, Mihalko, & Bane, 1997). Reliance on self-esteem measures may also negate detecting self-concept change.

Although the past 10 years has witnessed a growing interest in exercise effects on physical self-concept, body image, and certain physical self-perceptions such as perceived appearance (Shaw, Ebbeck, & Snow, 2000), competence/physical ability (Brown et al., 1995; Sonstroem & Potts, 1996), and fitness (King et al., 1993), the majority of extant studies have focused on overall self-concept. In the currently-expanding area of exercise

effects on physical self-perceptions, results have been consistently positive (e.g., Alfermann & Stoll, 2000; King, Barr Taylor, Haskell, & deBusk, 1989). However, in studies examining the effect of exercise on global and physical self-perceptions at the same time, results have been equivocal. For example Tucker (1982) and Brown and Harrison (1986) found both global and physical self-concept improved following exercise, whereas Sorensen (1997) found improved physical self-perceptions but no change in global self-concept. More well-designed studies assessing change in self-concept at both the global and sub-domain level are needed, preferably in non-clinical samples, and the measures used should be relevant to both the sample used and activity being measured.

There is also limited exercise research focusing on older adults and psychological well-being (Sonstroem, Speliotis, & Fava, 1992; Stoll & Alfermann, 2002) yet exercise appears psychologically beneficial to this population (McAuley & Rudolph, 1995; Paluska & Schwenk, 2000; Shephard, 1997; Tryon, 1998). Older women in particular have been largely overlooked in this area. This may be due to social stereotypes suggesting exercise is inappropriate or unsafe for this group (O' Brien-Cousins, 2000). Of additional concern extant studies involving older adults have mostly been negatively focused, with attention directed to disease reduction, in clinical samples. A more positive focus is needed.

Attention should be directed toward understanding and pro-actively promoting the positive outcomes of exercise including increased satisfaction with life in general, and overall psychological and emotional well-being in the general population. Older adults' barriers and motives to exercise, and social comfort or discomfort in the exercise settings also need to be explored and understood if we hope to successfully promote exercise to this group. Paradoxically, dwindling social-support systems, mental health problems, and quality of life are included among the growing health concerns of increasingly aging and

sedentary Western societies yet research efforts have paid little attention to exercise as either a positive socialising or mental health resource or as a potentially beneficial preventive therapy for this group. This is reflected in a paucity of well-designed trials involving older adults to provide sound supportive evidence.

In the literature search of controlled studies from 1970 to 2004 examining the effect of exercise on self-concept and physical self perceptions in non-clinical samples, conducted for this thesis, older adults, aged more than 50 years, were used in only five of the 33 studies located (see Table 2 Chapter 2 p.19). Of these, not one study focused on older men, and only one study examined older women; postmenopausal aged 50-75 years (Shaw et al., 2000). Exercise was found to enhance self-concept and/or physical self-perceptions in all five trials involving older adults, although only in those low on baseline self-esteem in the case of the older women's study. Fitness was measured in only two of the five studies. The effect of exercise on older women's self-concept and the relationship between fitness and self-concept outcomes warrant further research attention.

Exercise deserves consideration as part of preventive therapies and treatment regimes to enhance the psychological well-being of older women. Exercise may prove to have preventative as well as treatment benefits for this group, who usually live longer, often alone, with many having suffered loss and bereavement (Adamson, 1993; McAuley, Bane, Rudolph, & Lox, 1995). The literature reports physical activity decreases with age and older females are typically the least active (CDC, 1992; Lee, 1999). It has been suggested older women, who not only have the lowest levels of physical activity but as mentioned earlier, also suffer reduced social and economic resources (Adamson, 1993) should be the target of specific health promotion strategies (Brown & Bauman, 2000) including the promotion of exercise designed specifically for this population sub-group

(Dishman & Buckworth, 1996). The psychological benefits of exercise may prove the most salient benefit for motivating older women to initiate and to maintain an exercise regime (Murtrie, 1997; Shaw et al., 2000).

In studies involving younger samples it has often been assumed improved fitness accounted for improved self-concept following exercise, yet fitness has not always been measured. It is unclear whether improved fitness underpins the positive exercise self-concept association. It has been suggested that the perception of fitness, or some aspect of exercise participation rather than actual fitness, may account for the psychological benefits of exercise (Fox, 2000; McAuley & Rudolph, 1995; Plante, 1999; Stein & Motta, 1992; Wifrey & Kunce, 1986). There is some evidence supporting this view but without clearly defined exercise treatments in studies in this area results to date are speculative.

As pointed out earlier most research in this area has been conducted on groups of individuals exercising together. Yet the effect of the group on self-concept following exercise has received very little research attention. Some aspect of participating in exercise in a group setting rather than the exercise itself might be affecting physical self-perceptions and/or self-concept. A number of authors suggest the social aspect of exercise is important for psychological change (e.g., Biddle & Murtrie, 2001; Bravo et al., 1996; Jasnoski, Holmes, & Solomon, 1981), yet others claim it is not necessary (e.g., Glenister, 1996). However, Tice (1992) found identical behaviours had greater effect on self-concept when performed publicly than when performed privately. This suggests self-concept is more likely to change by internalising public behaviour than by behaviour that is identical but lacks the inter-personal context that a group provides. The effect exercise might be exerting on self-concept when the exercise is performed in a group setting needs to be further explored and the effect of the group determined.

By comparing a group of people exercising in a group to a similar group of people performing exactly the same exercise alone it may be possible to determine whether or not the group is having an effect on self-concept. This is the aim of Study 2. It compares a group of older women exercising in a group to a similar group of women performing the same exercise alone, and then compares both groups to a similarly motivated wait-list control group. The exercise modality is brisk walking. To examine possible mechanisms underpinning self-concept change a number of other variables will also be measured pre- and post-treatment. These measures include sub-domains of self-concept including physical and social self-concept, self-perceptions in exercise including perceived fitness, body condition, and exercise mastery, feelings of comfort or discomfort in the exercise situation, satisfaction with life and with self, and physiological and fitness measures. This will allow aspects of a preliminary exercise-self-concept model described in Chapter 2 to be tested. Study 1 will validate a self-perception questionnaire to be used in Study 2. Both studies will use samples of healthy older women recruited from the general population.

1.2 Purpose of the Thesis

1.2.1 To extend current knowledge of exercise effects on self-concept to older women.

1.2.2 To add to current knowledge of the effect of the exercise setting on self-concept.

1.2.3 To explore possible mechanisms underpinning the positive exercise-self-concept association, including the exercise setting (group and alone), and exercise-induced changes in fitness (real and perceived) and body condition (real and perceived).

1.2.4 To provide evidence of the psychological outcomes of exercise for older women.

1.3 Hypotheses

1.3.1 Exercise will positively and significantly affect older women's self-concept following exercise performed either alone or in a group.

1.3.2 The exercise setting will differentially affect older women's self-concept; effects will be significantly greater when the exercise is performed in a group setting.

1.3.3 Change in perceived fitness and body will account for more of the variance in self-concept change following exercise than actual/real fitness and body change.

1.3.4 Brisk walking will prove both aerobically and psychologically beneficial to older women who walk either alone or in a group. However, psychological benefits will be significantly greater for older women who walk in a group with similar others.

1.4 Defining Terms and Constructs

as they will be used throughout the thesis

Exercise is a sub-group of physical activity. It is *structured* physical activity.

A Group refers to two or more people engaging in behaviour together.

Self-concept is one's own *concept* of one's self, that is, one's own personal identity, or personal view of who you think you are (for further discussion see literature review; Chapter 2). As such it is descriptive. Self-concept is used synonymously with global self-concept, overall self-concept, and total self-concept.

Self-esteem is the *value* one places on one's own personal identity. As such it is evaluative. Self-esteem is *not* synonymous with self-concept. It is a sub-group of self-concept.

Self-worth is a personal *judgement* of how well one is doing; it is similar to self-esteem. It is *not* synonymous with self-concept. It is a sub-group of self-concept.

Self-perceptions are self-referent thoughts about oneself in a specific domain.

Self-efficacy is a belief about one's ability to perform a specific task.

Perceived competence is a belief of one's ability across a specific domain.

Perceived exercise mastery refers to a subjective assessment of exercise competence.

Mental health includes positive components such as positive affect (mood) and self-esteem, and negative components such as negative affect (mood), anxiety, depression, stress reactivity and low self-esteem.

Psychological well-being includes increased positive and reduction or absence of negative psychological health components (see above). Subjective components such as self-concept, self-esteem, satisfaction with self/life, and quality of life are also included.

Body condition (real or actual) refers to body weight, Body Mass Index, and body fat. It is synonymous with body composition a component of health-related fitness.

Perceived body condition refers to a subjective assessment of body weight, shape, fatness, and appearance.

Fitness (real or actual) refers to health-related fitness; comprising cardiorespiratory fitness and endurance, body composition, muscular strength and endurance, balance, flexibility.

Perceived fitness refers to a subjective assessment of one's fitness.

Aerobic exercise is exercise that improves the efficiency of the aerobic energy-producing systems and that can improve cardiorespiratory endurance.

Moderate aerobic exercise intensity is defined as 60-80% of maximum age adjusted heart rate or 50-75% of VO_{2max} (ACSM, 2000). Perceived exertion rate of 11-14 on the Borg 6-20 scale, equivalent to brisk walking, is considered moderate aerobic intensity.

Maximal aerobic capacity (VO_{2max}) is a measure of the body's ability to use oxygen to produce energy. Used synonymously with aerobic fitness.

Exercise intensity is rate of perceived exertion to be achieved during an exercise session.

Relative Perceived Exertion or Rate of Perceived Exertion (RPE) is a person's subjective assessment of how hard he/she is working.

The Borg scale is a numerical scale (6-20) used for rating perceived exertion.

Meta-analysis is a systematic approach to evaluating findings across studies by exploring the significance of combined findings; reported as an effect size (Cohen's *d*).

Effect Size (*d*) is an estimate of magnitude of an effect. It will be calculated using the formula: Cohen's *d* = (experimental mean - control mean)/ pooled standard deviation.

1.5 Theoretical Framework

Underpinning this thesis is the view that individuals and their behaviour are both directly or indirectly a function of the environment in which they exist. These three interrelated factors, behavioural, personal, and environmental are the basic elements of social-cognitive theory (Bandura, 1986) which provides a theoretical framework for this thesis. They are inextricably intertwined. Studying one without the other will answer only part of any research question with regard to human behaviour, including exercise behaviour. Too often in the literature individual-centred factors take precedence, and the social environment in which the individual exists is over-looked. This appears to be the case with a great deal of exercise research to date, an issue this thesis aims to address.

CHAPTER TWO: LITERATURE REVIEW

The following chapter comprises six sections. Each section attempts to answer a question relevant to the present thesis. First, is the reported exercise-self-concept association supported by sound experimental evidence?

2.1 EXERCISE AND SELF-CONCEPT: LITERATURE REVIEW

2.1.1 Research on Clinical Populations

The majority of studies examining exercise effects on self-concept found in the literature and those reviewed by Folkins and Sime (1981), Hughes (1984), Gleser and Mendelberg (1990), and Scully et al. (1998) have involved clinical samples. Examples of such samples include cardiac patients (e.g., Kavanagh, 1996), infertile females (Galletly,

Clark, & Blaney,1996), fibromyalgia patients (e.g., Martin, 1996), psychiatric inpatients (e.g., Powell, 1974), spinal cord injury persons (Guest, Klose, & Jacobs, 1997), clinically depressed individuals (e.g., Ossip-Klein, 1989; Singh, 1997), and children with cerebral palsy, brain damage, or mental retardation (Hutzler & Reches,1998). Collected data suggest exercise to be effective in enhancing self-concept in the clinical samples studied.

2.1.2 Research on Non-clinical Populations

Experimental trials examining exercise effects on self-concept conducted on samples recruited from the general population are limited. Results of an extensive literature review of controlled studies using non-clinical samples undertaken for this thesis are presented in Table 2. As shown in Table 1, the majority of the 33 studies located used special age/sex samples such as Grade 8 females, male undergraduates, and female college students. The search also located studies involving special populations. Examples of such samples include institutionalised individuals (e.g., Gary & Guthrie, 1972), overweight or obese adults (e.g., Grant, Todd, & Stoddart, 2004), obese children (e.g., Gately, Cook, & Carroll, 2000), rehabilitation patients (e.g., Collingwood, 1972), and juvenile delinquents (e.g., Hillyer, Wilson, & Brookes, 1982). Once again collected data suggest exercise to be effective in enhancing self-concept in the special population samples studied however, as with clinical samples they lack generalisability.

2.1.3 Literature Review Undertaken for this Thesis

It was, therefore, decided to search and systematically review studies of controlled trials using non-clinical samples without specific life problems. A review was prepared for publication, an overview of which follows. Guided by three research questions it examined a range of moderating variables and attempted to synthesize them with self-concept outcomes. First, do participant characteristics (age, gender) influence self-concept

outcomes? Second, do exercise characteristics (frequency, intensity, duration, type, and modality either aerobic or non-aerobic) influence self-concept outcomes? Third, are fitness and self-concept outcomes related?

Electronic databases PsycLit, Medline, PubMed, and Sport Disc were searched from 1970 to 2004 for controlled studies using non-clinical samples addressing the link between exercise and self-concept and physical self-perceptions. Selected bibliographies were also searched. The term self-concept used for the present review encompassed three synonymous terms; self-concept, total self-concept, and global self-concept. However, it did not include self-worth, self-esteem, or self-efficacy as these are considered discreet constructs both conceptually and theoretically, although these terms are often used inter-changeably in the literature. As research interest has begun to focus over the past ten years on exercise effects on the physical self, this review broadened the self-concept search to include physical and body self-concept and self-perceptions such as perceived physical fitness, shape, appearance, and physical ability.

Only studies published in peer-reviewed journals were selected because it was assumed they would contain sufficient detail for review purposes. Only studies using non-clinical, or normal, samples were selected for because these studies' findings may be generalized. Considering the difficulties associated with recruiting participants to exercise trials, and subsequent group assignment and adherence, a cut-off was not placed on sample size, and both random and non-random studies were included. More than 600 articles were located in the search of which 33 fulfilled inclusion criteria. In reviewing these studies sufficient details to allow the reader an overview of the current literature have been tabulated and presented in Table 2 (page 19). A total of 3866 subjects were included in the studies reviewed, all of which involved assessment of global self-concept

and/or physical self-perception prior to and following treatment (see Figure 1). However, pre- and post-fitness was only measured in 64% of studies reviewed. A majority of studies used convenience samples, few used female samples, and child and student samples predominated (see Table 1, p.14).

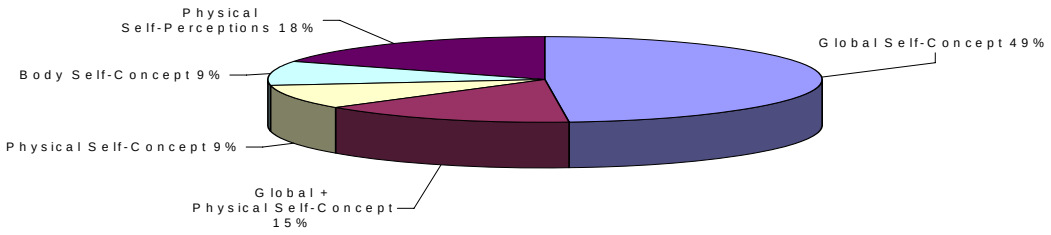

Figure1. Self-perceptions examined in the 33 studies reviewed.

In the 33 studies reviewed, 91% found either global self-concept or physical self-perception scores improved following an exercise intervention, including improvement in 87 % (16/21) of studies that measured global self-concept, and improvement in 100% of the 17 studies that measured physical self-perceptions. Overall three studies found no change in self-concept. All used convenience samples of young children (<12 years). Included in the 91% of studies mentioned above which reported improvement are nine that used multiple exercise treatment groups, four of which found self-concept improved only for a particular group (e.g., those low on self-esteem at baseline, weight-training group but not aerobic exercise group). Also included in the 91% of studies which reported improvement are five studies which measured both total and physical self-concept, three of which found both global and physical self-perceptions improved, whilst two studies, (Blackman & Hilyer, 1988; Sorensen, Anderssen, Holme, & Ursin, 1997) found no change in global self-concept, but physical self-perceptions did improve.

Table 1
Sample characteristics and recruitment / randomization methods in the studies reviewed

Population Sub-Group	Age Group			Gender			Group Allocation		Recruitment	Method
(number of studies)	Child	Student	Adult	Male	Female	M/F	Random	Non-Random	Convenience	Volunteer
Children (n=10)										
school children	10			1	2	7	5	5	9	1
Adults (students) (n=9)										
college students		5		2	2	1	2	3	5	
adult students		2			1	1		2	2	
undergraduates		2			1	1	1	1	1	1
Adults (not student) (n=14)										
adults of all ages			2		1	1	1	1	1	1
adults under 50 years			3		1	2	3			3
middle-aged adults			4			4	4			4
adults 50+ years			5		1	4	2	3	2	3
Total (N=33)	10	9	14	8	7	18	16	17	20	13

Of the 21 studies, which measured fitness, 20 found both self-concept and fitness improved. Treatments ranged from six weeks to one year (mean duration 17 weeks) with a mean frequency of three sessions per week for a mean 54 minutes per session duration. Across all ages, and for both sexes, neither type of exercise, aerobic or non-aerobic, nor exercise intensity or frequency, nor duration of the exercise session was found to moderate self-concept outcomes. Results were strongest for randomized trials; 10 convenience and 8 volunteer samples, the majority of which were conducted since 1993. All found either global self-concept or physical self-perception improved significantly (mean effect size of 0.63 for experimental versus control). However, a total of only 9 randomized-controlled trials involving samples of volunteers (all adults) from a literature search spanning 34 years is a pitifully small number. Although the situation is improving with regard to experimental design, objective participant selection criteria and random group allocation are considered key requirements for valid and useful research in this area.

Improved fitness is tentatively suggested as a moderating variable for self-concept improvement following exercise. This inference is based on available data only (fitness was not measured in 12 out of the 33 studies). Age was found to be a moderating variable. Gender was not. Results were strongest for pre-adolescents, adolescents, and adults. Of the three studies which reported no change in self-concept, all involved convenience samples of school children <12 years. However, in two of the latter studies ceiling effects may explain lack of significant change. Results indicate for children that a degree of autonomy is necessary for exercise to positively affect self-concept and in the case of young girls competitive exercise does not appear to be psychologically beneficial. The frequency, intensity, or type of exercise did not moderate results but duration of treatment did. Overall effect was larger (i.e., mean effect size) for treatments of more than 12 weeks.

In the case of older adults the limited evidence available suggests both aerobic and non-aerobic exercise of medium or low intensity performed either alone or in a group has the potential to improve the self-concept and/or self-perceptions of older adults. It must be remembered, however, this inference is based on only five controlled studies, only two of which were randomized, only two of which involved samples larger than 50, and only two of these studies measured fitness. Summaries of studies on older adults appear at the end of Table 2, which is organized according to age groups; (a) children, (b) adults (students), and (c) adults (non students). In the only study involving older women (Shaw et al., 2000,) physical self-perceptions improved only for women who were low on baseline self-esteem. The authors suggest ceiling effects or the type of exercise may explain this result. The study was part of a larger falls prevention trial, thus training involved lower body strength training. Of the remaining four older adult studies, one involved a sample of mean age 60.7 years, of whom 82% were female (Stoll & Alfermann, 2002); the exercise

group was 95% female. Training involved moderate intensity mixed exercise. Compared to no-exercise and attention controls, significant effects were found on body self-concept, perceived fitness, and positive self-worth for the exercise group; both controls remained unchanged. On the available evidence it is not possible to conclude what effect exercise has on older women's self-concept, but it may tentatively be viewed as positive.

Finally, addressing the effect of the group setting on self-concept, all but one study reviewed (King et al., 1989) involved exercise performed in a group setting. This would appear to indicate exercise performed in a group has a positive effect on self-concept. However, one study (King et al., 1993) compared two exercise settings, group and home, and different intensities, higher and lower, in a sample of 357 adults aged 50-65 years. Following 12 months of exercise, all experimental groups improved compared to controls on the physical self-perceptions measured, but no between-group differences were found. However, comparisons appear inequitable. Two home exercise groups were allocated either higher or lower intensity, whereas the group exercise condition involved only higher intensity. Results are not known for group exercise performed at lower intensity. Participation rates also varied between groups. In the one non-group study, a home-based exercise study (King et al., 1989), physical self-perceptions were found to improve.

In conclusion, results of the 33 controlled studies 1970-2004 reviewed for this thesis support the reported positive effect of exercise on self-concept. A brief tabulated summary of findings is presented at the end of Table 2. Evidence is stronger for adults rather than children, and for physical self-perceptions rather than global self-concept. A positive association was found between chronic exercise and self-concept, and an even stronger link was found between chronic exercise and physical self-perceptions. Overall effect size for exercise training on self-concept and physical self-perceptions was 0.46 for

aerobic exercise and 0.29 for non-aerobic exercise (for adults). Effect size for the effect of exercise on self-concept was 0.36, and on physical self-perceptions was 0.41, both in adult studies. Effect sizes were calculated using pooled standard deviations.

Supporting evidence is based on the majority of 33 experimental trials reviewed involving apparently healthy samples of reasonable size, employing adequate control, minimally adequate recruitment and group allocation procedures, exercise treatments of sufficient duration and intensity, and sessions at a frequency and duration to confer a fitness benefit. Furthermore, a representative range of exercise regimes, aerobic, non-aerobic, or both, were used. Assessment of self-concept and physical self-perceptions was acceptable. However, fitness assessment and follow-up assessment were found to be inadequate to allow firm conclusions with regard to the moderating effect of improved fitness levels on self-concept, or permanency of self-concept change to be established.

It is difficult to compare this review's findings based on controlled studies using non-clinical samples to extant exercise and self-concept reviews; Hughes (1984), Gruber (1986) focusing on children, and McDonald and Hodgdon (1991). Although Hughes' critical review of controlled experiments of effects of habitual aerobic exercise on mood, personality, and cognition found "exercise improves self-concept" (p. 66) the four studies reviewed which measured self-concept involved special populations with particular problems such as alcoholics and juvenile delinquents which as mentioned earlier were not included in the present review. As was the case with Hughes' review, McDonald and Hodgdon's meta-analysis was confined to studies using aerobic exercise, whereas the present review addressed all types of exercise, aerobic and non-aerobic. Furthermore, both included trials using samples with particular problems, and clinical, as well as non-clinical samples, which may affect the generalisability of findings.

Consistent with the present review, McDonald and Hodgdon's meta-analysis found a statistically significant increase in self-concept scores; overall effect size was 0.56 (n = 41) for the association between aerobic training and self-concept. However, a more recent meta-analysis by Spence and Poon (1997) addressing the effect of physical activity on self-concept of adults in non-sport settings reported an average effect size across 73 published and unpublished studies of 0.25, which although deemed small was significant ($p<.05$). Positive findings reported for older adults in the present review are supported in part by McAuley and Rudolph's (1995) review, physical activity effects on psychological well-being of older adults, which found "overall results of 38 studies reviewed are overwhelmingly positive" (p. 67); 87% used non-clinical samples. However, although results of the above reviews and meta-analyses appear to predict a positive outcome, the effect of exercise on older women's self-concept remains to be determined.

2.1.4 Exercise Self-concept Literature Review Summary and Conclusion

The extant literature provides evidence for a positive association between exercise and physical activity and self-concept in clinical and non-clinical samples. The review conducted for this thesis focused on exercise and self-concept in controlled studies using non-clinical samples of all ages and both sexes without particular problems participating in a range of exercise regimes. It may be the first to do so. Methodological problems noted in early studies notwithstanding, results support a positive association between exercise and self-concept. Although the underlying mechanisms involved are not yet understood, some mediating factors were identified. Effects were greater for physical sub-domains of self-concept rather than global, and for longer (>12 weeks) rather than shorter treatments. Age was found to be a mediating factor but type, intensity and frequency of exercise, duration of sessions, and gender were not.

Table 2

Summary of Literature Review: Effect of exercise on self-concept and physical self-perceptions in controlled trials, non-clinical samples, 1970-2004

Study Author(s) date	Sample Characteristics	Recruitment method	Duration of treatment	Study Design Treatment Protocol	Self-concept and Fitness Measures used	Group Allocation	Fitness Outcome significant compared to control)	Self Concept Outcome significant compared to control)
(a) Children								
Petrakis & Bahls	212 school children	Convenience	3 months	One school PE vs. One school no PE Control	MZSCS	Non-R	Not measured	No change
1991	Total population of 2 schools			30 minute sessions twice per week				
	Girls and boys Grades 1 to 4							
Martinek et al.	344 school children	Convenience	10 weeks	Physical activity program/gymnastics vs. Control	MZSCS	Random	Improved	Improved
1978	Girls and boys Grades 1 to 5			45 minute session once per week	PHSCS		motor skills	
Schempp et al.	208 school children	Convenience	8 weeks	Shared decision motor skills/gymnastics vs.	MZSCS	Random	Improved	Improved for both
1983	Girls and boys Grades 1-5			Teacher directed motor skills/gymnastics Vs Control	Motor skills test		motor skills	experimental groups
				45 minute session: 1 per week				((more for shared)
Walters & Martin	147 school children	Convenience	13 weeks	Intensive aerobic exercise (jog, skip) vs.	SPPC	Non-R	Not measured	No improvement
2000	Girls and boys Grades 3 to 5			Attention Control (minimally aerobic exercise)		Matched		
				30-40 minute sessions 5 times per week				
Faigenbaum et al.	24 children (7-12 years; X=10)	Volunteers	8 weeks	Progressive strength training vs. Control	MZSCS	Non-R	Improved	No change
1997	10 girls and 14 boys	Community		Two sessions per week (time not stated), using	Leg extension,			
	Experimental group 11M/4F			5 child-sized dynamic constant resistance machines	Chest press 6 RM			
Olv Salokuns	288 school children (12-18 yrs)	Convenience	10 weeks	Hockey vs. Athletics (sprints, jumps) vs. Control	TSCS	Random	Improved	Improved for both
1994	144 males and 144 females			One hour sessions, 3 times per week	Skills testing			experimental groups
Gillett et al.	61 school children (16-18 yrs)	Convenience	1 week	Wilderness camping and hiking vs. Control	TSCS	Non-R	Not measured	Improved
1990	M/F 12th grade students			Full day activities (details not stated)				
Marsh & Peart	117 school children (11-14 yrs)	Convenience	6 weeks	Aerobics (co-operative) vs. Aerobics (competitive) vs. Attentional Control (unstructured free play) 35 minute sessions twice per week	SDQII 7 exercise tests	Random	Improved	Improved only for co-operative group
1988	Females in 8th grade							

Notes: Control (C) means no exercise control, no intervention control, assessment only control; 1 RM means one repetition of the maximum weight lifted at baseline; M/F = Male/Female
KEY: BCS Body Cathexis Scale (Secord & Jourard, 1953); CSE Coopersmith Self Esteem Inventory (Coopersmith, 1967); MHR Maximum Heart Rate; MZSC (Martinek-Zaichkowsky Self Concept Scale for Children (Martinek-Zaichkowsky, 1977); PHSCS Piers-Harris Children's Self Concept Scale for Children (Piers, 1984); PSPP-A Physical Self Perception Profile for Adults (Chase, 1991); SPES Sonstroem's Physical Estimation Scale (Sonstroem, 1978); SPEQ Self Perception in Exercise Questionnaire (Sorensen, 1997); SPPC Self Perception Profile for Children (Harter, 1985); SPT Schneider Physical Test: Schneider (19 61); TSCS Tennessee Self Concept Scale (Fitts, 1965; Fitts & Warren, 1996)

Table 2 (continued)
Summary of Literature Review: Effect of exercise on self-concept and physical self-perceptions in controlled trials, non-clinical samples, 1970-2004

Study Author(s) date	Sample Characteristics	Recruitment method	Duration of treatment	Study Design Treatment Protocol	Self-concept and Fitness Measures administered	Group Allocation	Fitness Outcome significant c/f C	Self Concept Outcome significant c/f C
Blackman et al.	16 school children (M age =15 yrs)	Convenience	4 months	Dance team participation (aerobic) vs.	TSCS; BCS; CSE	Non-R	Improved	Improved (*ES* .59) on
1988	Females			Attention Control (physical education studies)	$VO_{2\ Max}$; RHR;	Matched	aero fitness	physical self concept
				One hour sessions after school 5 times pw	% Body fat		and strength	(No change in total SC)
McGowan et al. 1974	37 school children (7th grade)	Convenience	18 weeks	Progressive, competitive endurance run 3/4 times pw + sports 2/1 times pw vs. Control	TSCS	Random	Improved	Improved
	Males with low self esteem			One hour sessions 5 times per week	12 Min. Walk test		aerobic fitness	
(b) Adult Students								
Hilyer & Mitchell	120 college students	Convenience	10 weeks	Run Vs Run + counseling vs. Attention Control	TSCS	Random	Measured	Improved for run group *ES* .27 and
1979	Mean age 20 years			1 hour sessions 3 times per week: progressive	12-min run test		experimental	for run + counsel *ES* 1.03
	77 males and 43 females			Low Vs high self concept			groups only	group for those with low
				Analysed on baseline high and low self-esteem				baseline self concept only
Stein & Motta	89 undergraduates	Volunteers	7 weeks	Aerobic (swim) exercise (more women) vs.	TSCS	Non-R	Improved	
1992	Adults aged 18-42 years (M = 20)	University		Non-aerobic (weights) exercise (more men)	12 Min. Swim test			Improved total, physical, Social self-concept for strength group only
	Currently inactive (43M/46F)			vs. Attention Control (general studies)				compared to control
				80 minute progressive sessions twice per week				
Finkenberg et al.	18 students19-30 yrs (M=21 yrs)	Convenience	16 weeks	Adventure education class vs. Attention Control	TSCS	Non-R	Not measured	Improved total *ES* .17,
1994	10 males and 8 females			(general health studies class) Analysed Ms Fs				physical *ES* .58 SC
				One hour sessions twice per week				
Jasnoski et al.	39 females aged <30 years	Convenience	10 weeks	Aerobic exercise vs. Wait-list Control	Self-perception	Random	Improved	Improved perceptions of physical confidence
1981	Undergraduates			vs. Attention Control (psychology class)	Qu'aire by author		aerobic fitness	and of physical ability
	In 'fair' aerobic condition			One hour sessions twice per week	12 Min Walk test			
Trujillo	35 females (age not stated)	Convenience	16 weeks	Weight training vs. Running Vs Attention Control (normal activities: ball games, swim, ice dancing)	TSCS	Random	Improved for both experimental groups	Improved for weight training group
1983	College students			Session frequency, duration, intensity not stated				
Plummer & Koh	293 females 17-51 years (M=23)	Convenience	10 weeks	Aerobics vs. Attention Control (biology studies)	TSCS	Non-R	Not	Improved total *ES* .23,
1987	College students			Two or more sessions per week, time not stated		Matched	measured	physical self *ES* .21

Notes: Control (C) = no exercise control, or no intervention control, or assessment only control; 1 RM = one repetition of the maximum weight lifted at baseline; M/F = Male/Female
KEY: BCS Body Cathexis Scale (Secord & Jourard, 1953); CSE Coopersmith Self Esteem Inventory (Coopersmith, 1967); MHR Maximum Heart Rate; MZSC (Martinek-Zaichkowsky Self Concept Scale forChildren (Martinek-Zaichkowsky, 1977); PHSCS Piers-Harris Children's Self Concept Scale for Children (Piers, 1984); PSPP-A Physical Self Perception Profile for Adults (Chase, 1991); SPES Sonstroem's Physical Estimation Scale (Sonstroem, 1978); SPEQ Self Perception in Exercise Questionnaire (Sorensen, 1997); SPPC Self Perception Profile for Children (Harter, 1985); SPT Schneider Physical Test: Schneider (19 61); TSCS Tennessee Self Concept Scale (Fitts, 1965; Fitts & Warren, 1996)

Table 2 (continued)

Summary of Literature Review: Effect of exercise on self-concept and physical self-perceptions in controlled trials, non-clinical samples, 1970-2004

Study Author(s) date	Sample Characteristics	Recruitment method	Duration of treatment	Study Design Treatment Protocol	Self-concept and Fitness Measures	Group Allocation	Fitness Outcome significant c/f C	Self Concept Outcome significant c/f Control
McInman & Berger 1994	75 females aged 15-43 years Dance students	Convenience	Single session	Aerobic dance participation vs. Attention Control (doing other undergraduate activities) Single session one hour	SDQIII	Non-R	Not measured	Improved
Tucker 1982	105 males (age not stated) College students	Convenience	16 weeks	Progressive intense weight lifting vs. Attention Control (ancient history studies) 50 minute sessions twice per week	TSCS Strength tests	Non-R	Improved Strength	Improved total *ES* .39, physical self-concept *ES* .53
Tucker 1983	272 males (M= 21 years) College students	Convenience	8 weeks	Progressive intense weight lifting vs. Attention Control (health studies) 50 minute sessions twice per week	TSCS Bench press, squat, and arm curl	Non-R	Improved Strength	Improved total *ES* .37
(c) Adult non-students								
Wilfrey & Kunce 1986	83 adults 22-75 years (M=43) 46 males and 37 females	Convenience	8 weeks	Individual exercise program performed in a laboratory setting (walk, jog, cycle) vs. Drop-outs (n=34) acting as control group One hour sessions 3 times per week	TSCS	Non-R	Improved	Improved on physical self concept scale Total SC not measured
Ben-Shlomo & Short 1986	15 adults (23-41 years) Female, sedentary office staff	Volunteers University	6 weeks	Arm Ergometry Aerobic Strength Training vs. Leg Ergometry Aerobic Strength Training vs. Control 3 sessions per week at 60-80% MHR	TSCS BCS	Random	Fitness up. Not related to change in physical self-perceptions	Improved TSCS physical self & TSCS satisfaction Total SC not measured No change on BCS
Brown & Harrison 1986	83 adults in 2 age groups 42 middle-aged F (M=44 years) 41 young F (M=22 years) Females	Volunteers Community	12 weeks	Mature Weight Trainers vs. Young Weight Trainers vs. Control First 2 wks: 3 sessions per week at 60-70% 1 RM Weeks 3-12: 3 sessions per week at 75% 1 RM	TSCS 3 strength tests	Random	Improved	Improved total and physical self concept for both mature & young
DiLorenzo et al. 1999	82 adults aged 18-39 years (68% female)	Volunteers Community	26 weeks Follow-up at 12 mo.	Aerobic (cycling) Exercise vs. Wait-list Control 4 sessions per week 48 min. fixed intensity or 24 min. variable intensity	TSCS Cycle ergometer $VO_{2\ max}$	Random	Improved Aerobic fitness	Improved total *ES* .02 and physical *ES* .15 No difference interval & continuous intensity

Notes: Control (C) = no exercise control, or no intervention control, or assessment only control; 1 RM = one repetition of the maximum weight lifted at baseline; M/F = Male/Female
KEY: BCS Body Cathexis Scale (Secord & Jourard, 1953); CSE Coopersmith Self Esteem Inventory (Coopersmith, 1967); MHR Maximum Heart Rate; MZSC (Martinek-Zaichkowsky Self Concept Scale for Children (Martinek-Zaichkowsky, 1977); PHSCS Piers-Harris Children's Self Concept Scale for Children (Piers, 1984); PSPP-A Physical Self Perception Profile for Adults (Chase, 1991); SPES Sonstroem's Physical Estimation Scale (Sonstroem, 1978); SPEQ Self Perception in Exercise Questionnaire (Sorensen, 1997); SPPC Self Perception Profile for Children (Harter, 1985); SPT Schneider Physical Test: Schneider (19 61); TSCS Tennessee Self Concept Scale (Fitts, 1965; Fitts & Warren, 1996)

Table 2 (continued)

Summary of Literature Review: Effect of exercise on self-concept and physical self-perceptions in controlled trials, non-clinical samples, 1970-2004

Study Author(s)	Sample Characteristics	Recruitment method	Duration of treatment	Study Design Treatment Protocol	Self-concept and Fitness Measures	Group Allocation	Fitness Outcome significant c/f C	Self Concept Outcome significant c/f Control
Alfermann & Stoll	37 adults 25-50 years (M =38 yrs)	Volunteers	6 months	Aerobic and strength exercises plus games (e.g.	Self-worth	Random	Not	Improved on
2000	Healthy, sedentary (8 M/29 F)	Community		basketball, badminton) vs. Wait-list Control	Body self-concept		measured	body self concept scale
Study 1	78% Female			60 min sessions once week of progressive training	Perceived physical fitness			Perceived fitness *ES* .67
King et al.	120 adults middle-aged (M age 48)	Volunteers	6 months	Individual home exercise of moderate intensity	Questionnaire	Random	Improved	Improved on 4 scales:
1989	Healthy, sedentary (60M /60F)	Worksite		aerobic exercise (brisk walk/jog) vs. Control	devised for study		Aerobic	Perceived fitness,
	Lockheed Corp. employees			40-50 minute sessions 5 times per week	Expectations		fitness	satisfaction with shape and
				at 65-77% age-adjusted maximum heart rate	Treadmill VO2			appearance, satisfaction
				Participants phone-monitored each 3-4 weeks	Body weight			with weight
Brown et al. 1995	135 adults aged 40-69 years Middle-aged, sedentary	Volunteers Community	16 weeks	Mod. Int. walk(MW) vs. Low int. walk (LW) vs. Low int. walk and relaxation response (LWR) vs. Group tai chi Vs Control	SPES BCS Expectancies Body weight	Random	Improved VO2 for Fs in MW, LW Ms in MW, LWR. Not weight	Improved for all exp. groups for physical self perceptions of physical competence and body satisfaction
	Males and females			One hour sessions three times per week	VO_{max}			
Sorensen et al.	208 adults 40-50 years (M=45 yrs)	Volunteers	1 year	Diet vs. Diet + Aerobic exercise to music/Circuits/Jog	SPEQ	Random	Not	No change global SC
1997	Middle-aged (191 M/17 F)	Community		vs. Aerobic exercise to music/Circuits/Jog vs. Control	HASPP		measured	Improved physical self-
	92% Male			One hour sessions three times per week at 60-80%				perceptions of fitness,
				of individual peak heart rate on baseline treadmill test				mastery, physical ability
Alfermann & Stoll	72 adults (21 M/51F)	Volunteers	6 months	Aerobic exercise (jogging) or Mixed Sports vs.	Body self concept	Random	Improved	Improved on body
2000	Middle-aged(M=61 years)	Community	12 months	Attention Control (relaxation or back training)	Subjective well-being			self-concept scale.
Study 2	Healthy, sedentary		follow-up	All exercise was progressive	10 tests of motor			Perceived fitness jog
	71% Female			60 min sessions twice a week	performance			*ES* .51
Stoll & Alfermann	88 adults aged 50^{+} years	Volunteers	14 weeks	Supervised mixed moderate intensity exercise vs.	Four sub-scales of	Non-R	Not measured	Improved on body
2002	Healthy, sedentary M/F	Community		Attention Control (learn a foreign language) vs.	body self concept			self-concept scale *ES* .58
	82% female			Wait list control 60-70 min sessions 1 pw				Perceived fitness *ES* .46
Berryman-Miller	adults aged 55 - 85 years	Volunteers	8 months	Dance/ movement vs. Control	TSCS	Non-R	Not	Improved on total and
1988	Retired M/Fs (number not stated)	Community		90 minute sessions twice per week			measured	physical self-concept scale

Notes: Control (C) = no exercise control, or no intervention control, or assessment only control; 1 RM = one repetition of the maximum weight lifted at baseline; M/F = Male/Female
KEY: BCS Body Cathexis Scale (Secord & Jourard, 1953); CSE Coopersmith Self Esteem Inventory (Coopersmith, 1967); MHR Maximum Heart Rate; MZSC (Martinek-Zaichkowsky Self Concept Scale for Children (Martinek-Zaichkowsky, 1977); PHSCS Piers-Harris Children's Self Concept Scale for Children (Piers, 1984); PSPP-A Physical Self Perception Profile for Adults (Chase, 1991); SPES Sonstroem's Physical Estimation Scale (Sonstroem, 1978); SPEQ Self Perception in Exercise Questionnaire (Sorensen, 1997); SPPC Self Perception Profile for Children (Harter, 1985); SPT Schneider Physical Test: Schneider (19 61); TSCS Tennessee Self Concept Scale (Fitts, 1965; Fitts & Warren, 1996)

Table 2 (continued)

Summary of Literature Review: Effect of exercise on self-concept and physical self-perceptions in controlled trials, non-clinical samples, 1970-2004

Study Author(s) date	Sample Characteristics	Recruitment method	Duration of Treatment	Study Design Treatment Protocol	Self-concept and Fitness Measures	Group Allocation	Fitness Outcome significant c/f C	Self Concept Outcome significant c/f C
King et al. 1993	Healthy, sedentary 197M /160F 45% female	Community	12 months	High int. Group exercise vs. High int. Home exercise vs. Low int. home exercise vs. No-treatment Control High int. 40 min. sessions 3 pw at 73-83% MHR Low int. group 30 min.X 5 times pw at 60-73% MHR	Ratings of perceived change questionnaire devised for study Expectancies Body weight, VO2	Random	Improved VO2 max for all exp'mtal groups	Improved p'cvd fitness, shape/appearance, confidence, wellbeing for all exp. groups compared to C but no diff. in exp. Groups.
Shaw et al. 2000	44 females aged 50-75 years Post-menopausal, healthy, not currently weight training	Convenience Part of a larger falls-risk study	9 months	Weight training (lower body) vs. No training Sessions held 3 times per week Exercise was individualised and progressive	PSPP-A Peak force tests Muscular power	Random	Improved Strength Lost leg fat	Improved *ES* .55 perceived appearance only for low self-esteem participants
Perri & Templer 1985	42 adults 60-79 years (M=66 yrs) 64% Female	Volunteers Community	14 weeks	Walk/jog (low intensity) vs Control 3 sessions per week at 50 - 60% MHR	TSCS	Non-R	Not measured	Improved *ES* .81

					Self-concept measures used:	Group Allocation:	Fitness Outcomes:	Self-concept Outcomes:
SUMMARY:	Mean sample size =120	Conv''ce= 19 Volunteer= 14	M=17 weeks 1 single session	21 aerobic exercise 64% 5 strength/weight training 15%	TSCS X 16	R=18 of 33	95% Improved found fitness up	Overall 3 no change total self-concept all were samples of young children
N = 33 studies	Sample size range 15-344			5 aerobic and strength 15%	MZSCS X 4	56% were	in 20/21 studies when fitness was	and 2 studies global no change but
1970 to 2004	10 child samples		4 <8 weeks	1 dance movement (non-aerobic) 3%	By authors X 3	random	measured.	
Participants=3866	9 college/adult students	Over last11 yrs	11=8-12 wks	1 PE and exercise not specified 3%	BCS X 5	of which		physical self-concept improved.
	14 adult samples	13trials from'93 8 with	10=13-25 wk		SDQ X2	100% had	90% improved both	Overall in 91% of trials 30/33 either global or physical self increased. Global or physical up in 100% adult
	3 male samples	volunteers Post 1991 Volunteers=10	7=6-12 months		CSE X1	improved	fitness and SC/SPs	Studies and in 70% of child (7/10).
	21 mixed male/female samples	Conv'ce=5		6 Compared difference types of exercise:	PHSPS X1	SC or phys	In 19/21 studies	In 4 cases self-concept up for one or more groups only:
				2 Compared aerobic to non-aerobic	PSPP-A X1	self-perc'ns Post 1991:		Co-op group Marsh;
				2 Compared difference intensities of same exercise		Random=9		Weight group Trujilo;
				1 compared 2 age groups (young/Mid-aged Fs)	SPEQ X 1	Non-R=6		Run/counsel group Hillyer & Mitchell.
				Mean duration: 17 weeks, 54 minute sessions	SPPC X 1			
				Mean frequency: 3 times pw				

Note: All data rounded up to nearest whole number
Some studies have missing data

The summary of controlled exercise-self-concept studies reviewed (N = 33) and summarised in Table 2, highlight the need for researchers to focus attention on samples of older adults, including the sub-group of older women, to determine the effect of exercise on the self-concept of older adults, and women in particular. In order to identify mediating factors and possible mechanisms underpinning self-concept change following exercise, and group exercise in particular, a self-concept literature review is appropriate in order to attempt to understand what self-concept is and how it develops and changes over time.

2.2 SELF-CONCEPT: LITERATURE REVIEW

What people think and feel about themselves is generally considered a powerful mediator of human behaviour (Markus & Wurf, 1987). Attempts to understand behaviour are thus related to the terms “self” (in psychology) and “identity” (in sociology). One’s own concept of one’s own self or identity is of great importance. For this reason this thesis focuses on self-concept whereas a great deal of exercise research has focused on self-esteem, the evaluative component of self-concept. This section will attempt to answer the following questions. What is self-concept? How does it develop and change?

2.2.1 Defining Self-concept

Self-concept is perception-based. It is who we think we are, that is, one’s own perception of one’s own identity (Potkay & Allen, 1986). Self esteem is the *value* one places on that self-identity (Gruber, 1986) and self worth is a *judgement* of how well one is doing. However, it has been argued that perceptions of one’s self are actually how we think other people see us formulated according to how we are treated and how we compare ourselves to others (e.g., Hogan,1983). These perceptions may change over time. Developmental studies suggest self-concept is not innate but develops and changes with personal experience, self-awareness, and social interaction (e.g., Baumeister, 1987; Burns,

1979; Harter, 1999; Hattie, 1992). It has long been seen as multidimensional and hierarchical (e.g., Fox & Corbin, 1989; Harter, 1985; Hughes, 1984; Marsh & Shavelson, 1985). Accordingly, researchers have examined global self-concept, believed to be more general and enduring (e.g., Fox, 1990; Harter, 1985; Rosenberg, 1979) as well as content-specific domains of self-concept, believed to be more situation-specific and changing (Fox, 1990; Marsh, 2001). A number of sub-domains of self-concept, for example physical self-concept, believed to contribute to global self-concept have been studied and sub-scale scores developed for their individual measurement (e.g., Fox & Corbin, 1989; Marsh & Redmayne, 1994; Richards, 1987; Sorensen, 1999). Critical self-concept issues to be discussed next include global versus domain-specific aspects of the self and relative importance individuals place on selected domains of self-concept.

2.2.2 Global and Domain-specific Aspects of Self-concept

James (1890) first suggested that a person's overall self-assessment reflects an appropriately weighted average of specific domains of the self. According to James a person cannot be all things so she/he selects "the strongest, truest deepest self on which to stake their salvation" (p.310). James concluded that our self-concept depends entirely on 'what we back ourselves to be'. A view supported by Allport (1955). More recently, Marsh (1993) confirmed that relations between global self-concept and specific domains of self-concept are modified in relation to the importance that one places on each domain. This suggests individuals who undertake exercise training expecting to get fit and lose weight, might place importance on certain physical self-percepts, such as perceived body and fitness. Figure 2 attempts to illustrate this point, as well as the multidimensional (i.e., comprised of inter-correlated but separate facets) and hierarchical structure of self-concept (i.e., facets range from situation specific to the more general). .

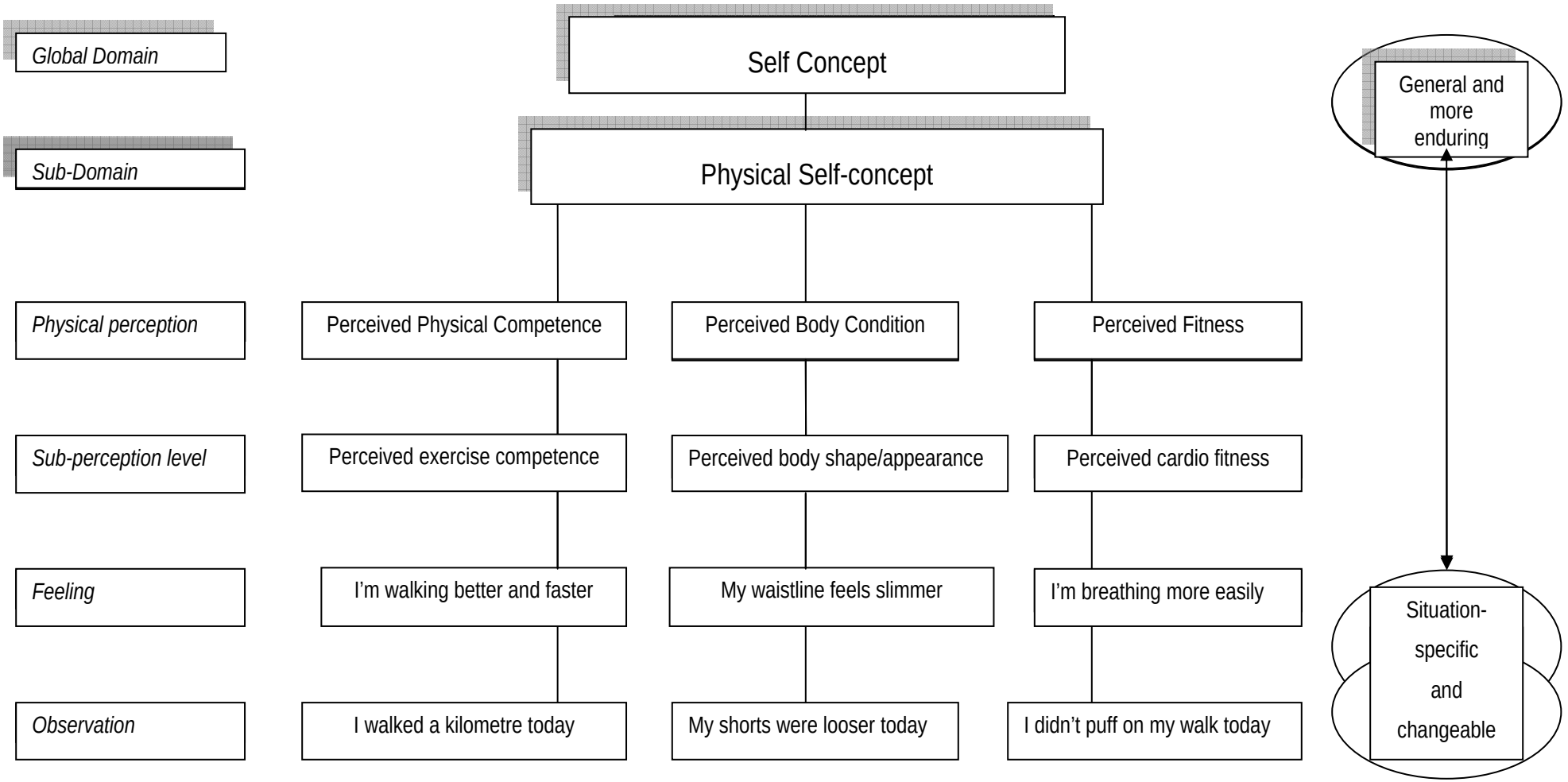

Figure 2. Levels of physical self-perceptions affected by participation in a walking program (adapted from Fox, 1990)

Note. For clarity, only physical self-perceptions are shown contributing to self-concept. Other sub-domains, such as personal, family, social sub-domains are not shown but they are believed to exist and contribute to self-concept in a similar hierarchical way.

Self-concept instruments focus on either a general measure of self-concept such as the Rosenberg Scale (1965) considered a “true” uni-dimensional scale, and Piers-Harris Children’s Self-concept Scale (Piers & Harris, 1969) a severely criticised nomothetic scale (Byrne, 1996), or on content-specific domains, that combine to give a global assessment such as the Tenessee Self Concept Scale (Fitts, 1965) (2nd Edition; Fitts & Warren, 1996) a taxonomic model which has been criticised by Marsh and Hattie (1994) for a scoring inconsistency although the authors concluded it was consistent with multidimensional self-concept structure. As these measuring instruments do not allow for the salience of domains for particular individuals, weighted models have been developed, and importance ratings such as the Perceived Importance Profile have been developed (Fox & Corbin, 1989). However, in the exercise-self-esteem area, Marsh and Sonstroem (1995) suggest the effect of importance ratings is negligible; a view supported by McAuley et al. (1997) who found middle-aged adults’ changes in ratings of importance to have little effect on change in physical self-worth following a 20-week exercise treatment.

Theory and research suggest researchers should consider both global measures of self-concept and an appropriate set of self-concept sub-scales in domains appropriate to the research question (e.g., Bracken, Bunch, & Keith, 1992; Marsh & Redmayne, 1992; McGannon & Spence, 2002; Sonstroem, 1998). In the area of exercise and physical activity, a number of instruments have been developed to assess sub-domains separately; the Physical Self-description Questionnaire (Marsh & Redmayne, 1994), Self-Perception in Exercise Questionnaire (Sorensen, 1997), and the Physical Self-Perception Profile (Fox & Corbin, 1989), which includes a global measure of physical self-worth. An overview of these physical self-perception instruments is presented in Table 22 (Appendix D4). Issues to be discussed next include internalisation, organisation, and social interaction.

2.2.3 Internalisation and Organisation

James (1890) viewed the self as dichotomous with two fundamental aspects: the subject 'I' and the object 'me'. The 'I' is conceptualised as 'the knower', the active agent for constructing the 'me'. The 'I' organises and interprets one's experiences. From this perspective 'me' is the empirical aggregate of things known about the self that is the self concept. Although James' view is currently paid less credence by social psychologists, it highlights two important aspects of self-concept, internalisation and organisation of self-referent thoughts. Fox (1997, p.114) compares the 'I' to a "self director" who organises experiences into a coherent structure or what Markus (1983) refers to as a self schema. Similarly Damasio (1999) contends human consciousness is organised by an executive. How we reflect and internalise life experiences, and thoughts and feelings about ourselves and how others treat us, to form our own overall view of our self is important at this point.

2.2.4 Reflected Self-Appraisals

One critical issue in self-concept formation and change is the notion that individuals internalise their own perceptions of others' perceptions of themself. That is, we internalise that which we *think* other people think about us. There are several suggestions as to how this occurs. First, Cooley (1912) suggested the concept of the 'looking glass self'. For Cooley, the process through which reflected appraisals are made involves our perception of how we think others see us. Likewise, according to Laing (1966) self-concept is a synthesis of "my looking at me with my view of others' view of me" (p.5). However, Mead (1934) suggested we consider what 'the generalised other' would think about us. For Mead the role of language, including verbal opinions is critical, as is internalisation of these opinions in the form of how people in general would think. Alternatively, Rosenberg (1986) suggested people actively take the role of the other and

see the self from the other's perspective; a process he calls reflexivity. More recently, Tice (1992) expanded on Cooley's notion of reflected appraisals. He suggests the looking glass self may actually function as a magnifying glass as self-perceptions are internalised. Tice demonstrated that what one sees in oneself while others are present has an extra powerful impact on self-concept formation. However, not all appraisals are based in the present, some appraisals are projected into the future, some of which are known only to the self.

2.2.5 *Possible Selves*

Possible selves comprise self-perceptions of how individuals think about their potential and their future (Markus, 1983). Individuals internalise not only their current thoughts and feelings about themselves and how they think others perceive them, they also perceive their future self according to what they fear, hope, or plan to become. These latter perceptions are powerful because they are known only to the individual. Self-concept gives rise to possible-selves, and it is possible selves that create motivation for behaviour (Franken, 1994). Possible selves have been shown to be powerful mediators of exercise behaviour (Whale, 2003). They hold the potential to explain why some new exercisers adhere while others drop out. Adherers attribute more importance to a hoped-for possible exercise self than those with negative or feared future exercise selves, because they believe it possible to become an exerciser (Whaley & Ebbeck, 2002). In a study with middle-aged women Whaley (2003) demonstrated women can relate to a possible physical self not of their own choosing. This has important implications for interventions in the area of exercise and/or health behaviour change in older women.

2.2.6 Self-concept as a Process

Thus far there is a common thread. Self-concept formation and change involves a process of internalising self-referent thoughts about the self. However, the detail of this

process remains unclear. It may be a developmental life-process with critical periods (Burns, 1979; Harter, 1994) as the self is defined and re-defined. According to Baumeister (1987) our concept of self is an evolving self-defining and redefining process with three aspects of self-definition: assignment (e.g., gender), achievement (e.g., wealth), and choice (e.g., career). Across the lifespan new self-definitions will be added whilst extant selves will increase or decrease in salience, at times in a compensatory or protective manner. The self may remain a collection of selves (Harter, 1999) or develop as a structured whole as discussed earlier. There is no current consensus.

It is generally accepted, however, self-concept is not static. According to Epstein (1973) and Sullivan (1953) it is dynamic. Epstein posits self-concept is neither an entity nor a construct, but a dynamic theory of one's reality. A self-theory solves the problem of how the self can be both the subject and the object of what is known and like all theories it is able to expand and develop with exposure to new information and new experiences. Similarly identity theorists such as Erikson (1950) view the self as evolving self paradigm. Most theorists agree self-concept develops and changes across the lifespan. It is believed the dimensionality of self-concept structure increases with age and remains multi-dimensional throughout the adult years. However, as suggested above, saliency and distinctiveness of sub-domains change with increasing age (Harter, 1999; Marsh, 1993).

2.2.7 Social Context and Internalisation

We respond to our own internal thoughts on the basis of our own values, beliefs, standards and norms, modes of reasoning, and moral concepts. But our viewpoint may be as Mead (1934) made clear, based on our internalisation of a generalised viewpoint of the society we live in. Thus the social context influences internalisation (Rosenberg, 1986). Internalisation refers to the act of bringing one's private concept of self into agreement

with one's recent behaviour (Festinger, 1957). Internalisation is thus a potentially powerful mechanism for self-concept change as is the salience of the thoughts to the individual. This suggests self-concept change may be affected by the sub-society in which internalisations take place because different social settings are likely to have different values, standards, and norms. Take for example a fitness centre setting. People exercising in this setting may perceive themselves as fitter, for example than a person exercising at home because internalisation takes place in light of the values, beliefs, and norms associated with the "get fit" connotations of the fitness centre environment. They would be more likely to view themselves as a fit person, which leads to the next but slightly different aspect of self-concept development, self-definition.

2.2.8 Self-schemas and Physical Self-definitions

A relatively new explanation of self-concept involves the development of domain-specific identities or self-definitions referred to as self-schemas (Stein, 1996) which have been identified in older adults (Whaley & Ebbeck, 2002). Physical self-definitions are not formed simply as a consequence of engaging in a physical activity, however. One does not come to view oneself an "exerciser" for example merely by participating in an exercise class, or "a sportsperson" just because you play tennis once a week. Kendzierski, Furr, and Schiavoni (1998) found perceived effort, commitment, and enjoyment of exercise, were criteria for exercise self-definition. Similarly, Baysden (1997) found sport commitment and enjoyment positively correlated with athletic self-definition. This is an important finding. Perceived competence, perceived effort, and enjoyment are also variables implicated in intrinsic motivation (Deci & Ryan, 1985) which will be discussed later, but briefly, people are more likely to adhere to exercise programs when they are intrinsically motivated.

2.2.9 Self-concept Literature Review Conclusion

The viewpoints considered here give credence to the view that self-concept development and change is a dynamic process of reflection and internalisation associated with social interaction. It has been suggested that self-concept formation can only occur with reference to a group. Consensus exists as to the multidimensionality, hierarchical, life-span developmental nature of self-concept. However, whether dimensions of self-concept are organised into a unified whole or remain a collection of separate selves, is an issue which remains unresolved. Because internalisation appears to occur at both conscious and non-conscious levels it is a detail that may remain unresolved. This thesis suggests that one's concept of one's self is, for many people, a collection of selves both consistent and changing. In times such as the present, where social roles are less clearly defined and social values and norms are constantly undergoing rapid change it may be difficult for some people to form an overall theory of self. However, for some people this will be possible. The stability of the social context in which the individual exists is suggested as an important mediating factor. It is now time to expand the scope of this review to the benefits of exercise both physiological and psychological.

2.3 BENEFITS OF EXERCISE: LITERATURE REVIEW

This section asks the following question. Does the literature provide sound evidence for the popularly held view that exercise is good for you? Where the literature provides such information, the benefits of exercise to older adults will be reported.

2.3.1 Psychological Benefits of Exercise

Although exercise has become increasingly popular as a means of achieving physical and mental well-being, the ideal of a healthy mind in a healthy body is not new. The benefits of all things being in harmony; social, physiological, and psychological with

‘mens sana in corpore sano’ was an idealised belief long before Cooper’s (1977) ‘new’ aerobic way to health and fitness. A survey by Smith and Gould (1996) confirms a continued wide-spread popular belief that psychological benefits of exercise may equal if not surpass physical benefits. However, although a considerable body of evidence can be found in surveys, reviews, and meta-analyses supporting a positive relationship between exercise/physical activity and mental health/psychological wellbeing, public health policy documents are slow to act on this evidence. Psychobeneficial recommendations are either lacking in most international public health documents, or references when made are couched in qualifiers such as ‘tentative’ and ‘suggestive’.

This may reflect concerns with methodological issues and terminology, lack of uniformity in measures, and limited evidence for improvement in the general population, with greatest improvements found in clinical samples. Policy decisions require a stronger evidence base. To illustrate this point, Table 21 (appendix D3) presents an overview of meta-analyses, surveys, reviews in this area. Perhaps if the literature were disseminated to more clearly reflect subjective well-being benefits of specific exercise prescriptions to specific groups of people providing a more clearly defined evidence base this problem may be reduced. A cross-disciplinary approach also appears warranted with exercise psychologists communicating more clearly and directly with related fields such as exercise physiology, behavioural medicine, and public health policy and promotion.

In the case of older adults McAuley and Rudolph’s (1995) review, as mentioned earlier concluded a positive relationship exists between exercise and psychological well-being, with the effect being fairly stable across age and gender, irrespective of fitness improvements. Rejeski and Milhalko (2001) support this view. However, in an earlier overview of physical activity, ageing, and psychological well-being literature, Brown

(1992) concluded methodological problems preclude drawing positive conclusions. It is difficult to conclude mediating factors considering studies in this area involving older adults are extremely limited. However, in the wider literature gender effects have been equivocal. Stephens (1988) found physical activity more beneficial psychologically for females rather than males whereas meta-analyses have reported either greater benefits for males (North, McCullagh, & Vu Tran, 1990) or equal benefits (McDonald & Hodgdon, 1991). A majority of authors report benefits stronger for older rather than younger groups.

In summary, despite the methodological problems noted by a considerable number of authors (e.g., Biddle, 1995a; Gleser & Mendleberg, 1990) the weight of current evidence gives credence to the view that exercise offers psychological benefits to most people. Strongest evidence in the mental health area is for beneficial effects of exercise on depression and state anxiety (Landers, 2002), but a dose-response is yet to be established. In the psychological well-being area as pointed out earlier evidence for a positive exercise self-concept association is sound, and strong evidence exists across all age groups and both genders, indicating people who are more active exhibit lower levels of anxiety and depression (e.g., Paluska & Schwenk, 2000), and higher levels of psychological well-being (e.g., Stephens, 1988). It is also important to note, a considerable number of authors report mechanisms are not well understood and call for more well-designed trials. Considering the reluctance of policy makers to accept current evidence for psychological benefits of exercise and in order to provide a true interpretation of the literature in this area it is appropriate to examine the extant research in terms of its scientific quality.

2.3.1.1 Methodological Inadequacies

Methodological problems mentioned above highlight the difficulties researchers face in designing scientifically-sound studies aimed at measuring real (or actual) change in

psychological variables. An awareness of these problems is necessary if we wish to minimise them in future research in this area.

2.3.1.1.1 Defining terms and measures used. Methodological problems begin with terminology; psychological well-being and mental health. In some reviews these terms are treated synonymously whereas in others mental health focuses on affect and reduction of anxiety and depression whilst psychological well-being can often mean whatever variable the researchers choose to measure. Examples of such variables include self-concept, self-esteem, quality of life, emotional/subjective wellbeing and elevated mood. Alternatively a reduction in anxiety and/or depression may be used as a measure of psychological well-being. Lack of uniformity in definitions and measures used is a major problem in this area. It is little wonder policy-makers call for a stronger evidence base. Exercise psychologists should be working on clearly detailing the positive quality-of-life benefits of exercise to health policy makers. Or at least be attempting to clear the muddy waters that we have at the moment where it is unclear what the phrases mental health benefits and psychological benefits actually mean. There appears to exist at the moment a conceptual problem hampering the provision of a sound evidence base to policy makers. In addition many studies have not defined the exercise treatment or its outcome/effects in specific terms. Lack of uniformity of measures used to assess fitness also exists and the aspect or aspects of fitness being measured are often not made clear.

2.3.1.1.2 Non-equivalent groups at baseline. Physical differences and associated personality differences can confound results (Blumenthal, Williams, Heedels, & Wallace, 1982) because personality differences have been noted between athletes and non-athletes (Morgan & Pollock, 1978) and between delinquents and non-delinquents (Levy, 1997). It may be it is these differences that are being measured and not exercise effects when

special groups are studied or when active and inactive groups are compared (Hillyer et al., 1982). Positive change may be due to initial fitness, or self-concept/self-esteem levels since positive results are consistently found to be most pronounced with subjects who are more distressed or less fit prior to exercise treatment (e.g., Bowman, 1981; Shaw et al., 2000; Wilfley & Kunce, 1986).

2.3.1.1.3 Hawthorn effects. Psychological improvements may be due to participant expectation, halo, and Hawthorn effects (Lloyd & Mayes, 1990). When participants self-select, an interaction effect between selection bias and the treatment variable, exercise, would threaten external validity. Self-selected, motivated volunteers may demonstrate improvement in psychological functioning simply because they are taking part in a research project and motivated for physical and overall self-improvement (Wilfley & Kunce, 1986). Thus it would appear necessary for experimental design to include control groups with expectations equal to those of the experimental participants or in some other way to control for possible differences in expectations (Brown et al., 1995).

2.3.1.1.5 Self-report. Self-report measures used in most research in this area further potentiate self-reporting biases and is a constant problem in this area. However, attempts have been made to identify biases with the potential to invalidate results. For example, the Tennessee Self Concept Scale uses a Faking Good score together with four validity scores designed to identify socially desirable or other unusual or distorted response patterns and uses a Self Criticism scale to test the veracity of the test-taker's responses. Qualitative studies are currently gaining greater credence and may have the potential to eliminate self-bias if reliability and validity can be established.

2.3.1.1.6 Failure to measure sub-domains. In the exercise-self-concept area, sub-domains are often not measured although theory emphasises the multidimensionality of

self-concept. Many studies have adopted a one-dimensional perspective (Marsh, Parada, & Ayotte, 2004). They neglect to score domain-specific aspects of self-concept such as physical self-concept, or facets of physical self-concept such as perceived body, relying instead on global measures, which may not reveal change in specific self-percepts (Bracken, Bunch, & Keith, 1992). For example, Montgomery and Shanti (1996) found physical self scores changed significantly yet change in total self-concept was not significant. Alternatively some studies have measured sub-domains but neglected global self-concept. To identify true effects of exercise, both general and specific aspects of the self should be measured (McAuley et al., 1997; Sonstroem, 1998). In addition, measures must be relevant to the physical activity being studied (McAuley et al., 1984).

*2.3.1.1.7 Adhere*nce. Finally, it is important to recognise the difficulties associated with adherence to exercise programs. Adherence and 'drop out' research (e.g., Pate, Pratt, & Blair, 1995) indicates it is almost impossible to identify truly representative samples from the general population for several reasons. First, researchers are limited to study participants who volunteer to participate. They may not be representative. Second, final samples comprising participants who have not only volunteered, but have also adhered to the program for a considerable length of time, will be even less representative. This presents a major challenge to researchers to design studies with the potential to produce valid, generalisable results. Few studies adopt an invitation to treat design because of the difficulties associated with following up those who drop out. Once again it is a challenge to researchers to design studies which maximise adherence, yet avoid coercion, and to somehow obtain data from participants who drop-out of treatment.

2.3.1.2 Psychological Benefits of Exercise Conclusion

Methodological issues notwithstanding, the above literature review supports the view that exercise offers psychological and mental health benefits. Methodological problems discussed above highlight a critical premise, that within the bounds of human possibility, scientific rigour is essential in planning and conducting trials, and interpreting results of exercise effects on psychological variables such as self-concept. In research of this nature to ensure external validity samples from the general population are required and once a group of apparently-healthy participants is identified matching for potentially confounding variables and random allocation of participants to experimental and control conditions should be considered mandatory. This should ensure sound evidence delivery to health policy makers.

2.3.2 Physiological Benefits of Exercise

As the present study is primarily concerned with exercise effects on psychological variables, the physiological effects of exercise will be discussed only briefly. It should be kept in mind, however, that physical and fitness changes may impact psychological change and this association will be examined in Study 2. Observable and measurable somatic changes might affect self-perceptions and subsequently affect physical and then global self-concept. Table 3 presents the most commonly cited physical benefits and physical effects of regular exercise. These benefits and effects are, however dependent upon input. A certain level of intensity and frequency is required to affect physiological change. It follows that researchers who aim to measure physical fitness should adhere to clearly defined exercise prescriptions of sufficient intensity, frequency, and duration to ensure possible physical change. It is also worth noting that commitment or “taking it seriously” (Kendierski et al., 1998) is considered an important criterion for physical self-definition. In the case of older adults, reviews and intervention studies have demonstrated

that exercise initiated later in life can result in increased muscle strength, improved balance and flexibility, and modest changes in levels of body mass and fat (e.g., Buchner et al., 1992; Lee, 1999; Sidney & Shephard, 1977; Singh, 1997). Older adults who maintain a physically active lifestyle have been found to be aerobically fitter than their sedentary counterparts. In addition studies have demonstrated sedentary older adults who engage in exercise programs can achieve aerobic fitness benefits as measured by VO_{2max} (e.g., Shephard, 1995). A review of exercise prescription guidelines and the risks of exercise will be presented next.

Table 3

Physical Benefits and Effects of Regular Exercise

Physical Benefits of regular exercise	Physical Effects of regular exercise		
Most commonly cited physical benefits:	Physical effects:	Aerobic Exercise	Resistance Exercise
• optimised body weight through reduced adiposity (fat)	* Body condition		
• increased muscle tissue and bone mineralisation	(a) % fat	⇓ ⇓	⇓
• improvement and maintenance of muscular strength	(b) lean body mass	⇔	⇑ ⇑
• changed negative habits in a positive direction	* Resting heart rate	⇓ ⇓	⇔
(e.g., cigarette smoking, diet, excessive alcohol intake)	* VO_{2max}	⇑ ⇑ ⇑	⇑ ⇔
• improved physical work capacity	* Sub-max endurance	⇑ ⇑ ⇑	⇑ ⇑
• increased cardio-respiratory efficiency	* Basal metabolism	⇑	⇑ ⇑
• reduced and/ or control of hypertension	* Serum lipids		
• reduced risk of coronary disease	(a) HDL cholesterol	⇑ ⇔	⇑ ⇔
• improved glucose tolerance	(b) LDL cholesterol	⇓ ⇔	⇓
• increased soft tissue and joint flexibility			
• improved blood lipid profile i.e. reduced cholesterol			
• improved balance and reduction in falls			
• reduced risk of colon cancer			
Adapted from Serfass and Greberich, (1984)	*Adapted from Pollock and Vincent, (1996)*		

KEY: ⇑ = values increase: ⇓ = values decrease; ⇔ = unchanged; Single arrow = small effect; Double = medium; Triple = large effect

2.3.2.1 Exercise Prescription

The three aspects of exercise prescription are frequency, intensity, and duration all of which have the potential to affect both physical and psychological outcomes in exercise

research. It is generally accepted that exercise must be regular and continuous (e.g., Egger, Champion, & Bolton, 1998) and that duration should be at least eight weeks for physiological changes to accrue (Serfas & Gerberich, 1984). Fox (2000) suggests 10 weeks for minimally significant change. The American College of Sports Medicine (ACSM) (2000) guidelines for cardiorespiratory fitness recommend continuous aerobic activity at 60-90% of age-adjusted maximum heart rate for 30 minutes per session, five days per week, for all ages. Although Pate et al. (1995) suggests 10 minute sessions can be accumulated for health benefits. It is generally agreed exercise below 70% of target heart rate is reported to not produce significant aerobic improvement and exercising over 85% can over-stress the cardiovascular system.

Beneficial exercise should involve the large muscle groups and be rhythmic and aerobic in nature. Walk, jog, cycle, and low-impact group dance/exercise are suggested modalities meeting these criteria. For not-currently-exercising adults of all ages the ACSM recommends low-impact low to moderate intensity activity (that is, walking rather than running) due to potential hazards (greater cardiovascular risk and orthopaedic injury) and drop-out problems associated with high intensity activity. It is further suggested that high levels of intensity are not required for psychological benefits to accrue in healthy adults (e.g., Cramer, Nieman, & Lee, 1991; Moses, Steptoe, & Edwards, 1989). It follows that exercise treatments targeting measurable change in aerobic fitness in apparently healthy adults should prescribe a conditioning phase in which participants exercise aerobically at 60-85% of their maximum heart rate for at least 20 minutes. On the other hand, no conclusive evidence exists with regard to the optimal exercise prescription for psychological benefits (Ekkekakis, Hall, & Petruzzello, 2000).

2.3.2.2 Risks Associated with Exercise

2.3.2.2.1 Physical risks. It must be recognised that there are risks associated with exercise, but they are rare and can be avoided if appropriate choices are made in the selection of type of exercise, intensity level, and the duration and frequency of exercise. It is generally accepted that inactivity poses a far greater risk to one's health particularly coronary heart disease (Powell & Blair, 1994). Physical risks range from the rare occurrence of sudden cardiac death to the more commonly reported musculoskeletal injuries such as strains, sprains, soreness, and bruises. Exercisers may minimise risks by being aware that certain factors increase the chance of injury, for example, overtraining, cigarette smoking, failing to warm-up and cool-down, alcohol consumption prior to exercise, exercising in extreme temperatures, and prior orthopaedic injuries (Beaglehold, 2001). In the case of older adults, the five exercise-self-concept studies reviewed earlier involving adults >50 years, reported no serious injuries, only one sprain, and one orthopaedic problem from a previous undisclosed injury.

2.3.2.2.2 Psychological risks. The psychological risks of exercise are very low. However, mood disturbances have been reported due to overtraining in elite athletes (Morgan, Brown, & Ellickson, 1987) or due to exercise withdrawal amongst habitual exercisers (Morris, Steinberg, & Salmon, 1990). It has also been suggested that some individuals may become addicted to exercise and this obsession may lead to detrimental effects upon health and social functioning (Steinberg, Sykes, & LeBoutillier, 1997). Although this type of addiction appears to be rare and has consistently been associated with weight loss preoccupation and obsessive-compulsiveness (Davis, Brewer, & Ratusny, 1993) it appears to be a growing problem due to media fixation with the ultra-slim female form, and more recently, the well-defined 6-pack male form.

2.3.2.3 Physiological Benefits of Exercise Conclusion

The physiological and fitness benefits of exercise are well documented including sound evidence supporting the view that exercise can improve fitness levels in all people including older adults, particularly strength and aerobic power. A sound evidence base ensures exercise should be promoted and prescribed to people of all ages and both sexes, by health professionals and health public policy makers. Exercise offers physical benefits to both clinical and non-clinical groups and those experiencing specific life problems. Risks are minimal and can be avoided with public education and appropriate prescription. The psychological benefits of exercise were acknowledged earlier as was the positive effect of exercise on self-concept a variable indicative of psychological well-being. Next, an attempt to understand how exercise positively affects self-concept is appropriate.

2.4 POSSIBLE MECHANISMS UNDERPINNING SELF-CONCEPT CHANGE: LITERATURE REVIEW

This thesis contends that more than one mechanism underpins self-concept change following exercise. And further, a mechanism is not likely to be a single factor, but an inter-play of a number of mediating factors. For example, the exercise setting may be one mechanism. However, a complex interplay of mediating factors associated with exercising in for example a group setting will combine to form such a mechanism. What are the possible mechanisms and mediating factors?

An extensive review of the literature reveals a number of physiological and/or psychological factors associated with the exercise itself and a number of psychological factors associated with participating in an exercise program which may affect self-concept either directly or indirectly. Figure 3 attempts to summarise these suggested factors from the literature and schematically show how they may interact to affect self-concept. This is

a “work in progress” with regard to the mediating factors involved and to the process of change. Descending arrows connect factors in a tentative cascade of change. The figure does not suggest how specific mediating factors interact to form a mechanism. It is not a model it may best be described as a flow chart.

At the top of Figure 3, factors associated with exercise itself and with participating in the exercise program are listed. Each of these factors singly, or combined with other listed factors might affect the changes, either physiological or psychological, at the second level. Or effects may be seen at a lower level. Not shown are the more complex lateral interactions which this thesis attempts to explore, and the literature provides limited evidence for. That is the link between actual and perceived fitness and the effect each of these factors has on physical and/or global self-concept. Exercise factors and program factors will also interact. For example, frequency might be positively affected by the alone exercise setting because the participant can exercise at any time.

As shown in Figure 3, exercise factors and exercise program factors both affect aspects of perceived health-related fitness, then perceived physical competence, and then self-concept. However, it is also likely both exercise and program factors directly affect self-concept via actual fitness change and/or bio-chemical change or via time-out or cognitive diversion. Aspects of real and perceived health-related fitness and physical competence are also listed, but it will not be possible to explore all of these factors in this thesis. A range of possible mediating factors and associated mechanisms underpinning self-concept change will be discussed next, and those warranting further examination will be determined.

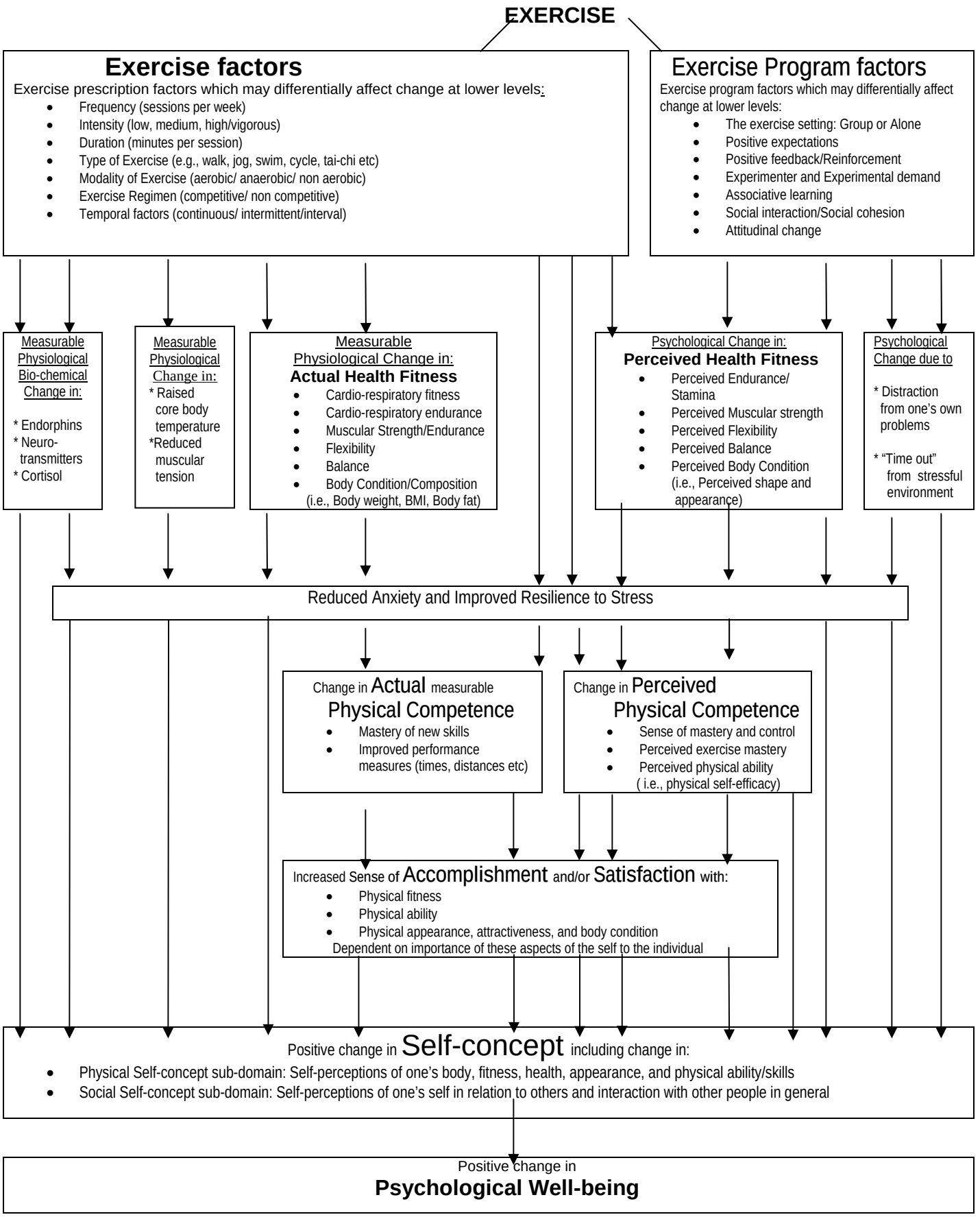

Figure 3. Flow Chart: Effect of exercise per se (exercise factors) and effect of participating in an exercise program (exercise program factors) on self-concept and psychological well-being

2.4.1 Sense of Mastery and Control

A sense of mastery and control may positively affect physical and global self-concept. Exercise is believed to provide an opportunity for individuals to develop a sense of mastery and control over themselves and their environment. Mastery occurs when exercisers perceive themselves as being physically improved (Hughes, 1984; Shaw et al., 2000; Stein & Motta, 1992). The response to increased work-load and exertion necessary to perform exercise is contingently rewarded by gains in flexibility, muscle size, strength, and endurance, as well as increased cardiorespiratory fitness and endurance. By recording exercise sessions completed and measurable changes such as increased weight lifted and number of laps walked, participants view themselves attaining mastery of an exercise task (Beck, Shaw, & Emery, 1979). Such changes might suggest to exercisers they are gaining mastery and control over their environment (Seligman, 1974). As a result, they feel more comfortable in the exercise situation and physical self-perceptions might be enhanced.

Enhanced perceptions of mastery have been reported in a number of studies following exercise (e.g., Jasnoski et al., 1981; McAuley, 1991) and women have been found to achieve a sense of empowerment through exercise participation (Hall, 1990). For first-time exercisers and those returning to exercise in their retirement years, the benefits of feeling strong, powerful, and competent may be new/renewed and exciting experiences (Berger & McKenzie, 1980). Such feelings might positively affect physical self-concept and in turn global self-concept. There might also be carry-over effects if improvements heighten the individual's ability to take up other new tasks (Bahrke & Morgan, 1978) including lifestyle change (Dargie & Grant, 1993). This is important as it suggests participants leaving an exercise program with enhanced self-concept may subsequently undertake other new activities with the potential to further enhance their self-concept.

2.4.2 Perceived Physical Competence

Perceived physical competence would be expected to include feelings of mastery and control of oneself and one's environment. As shown in Figure 3, perceived physical competence may affect self-concept directly or via feelings of accomplishment and satisfaction with the physical self. Perceived physical competence is suggested to be based not only on feelings of mastery and control but also on perceived physical ability, which McAuley (1991) conceptualised as physical self-efficacy. Alfermann and Stoll (2000) demonstrated self-efficacy is directly related to perceived competence. Improved self-efficacy following exercise has been documented in a range of samples including middle-aged and older adults by McAuley and colleagues (e.g., 1991, 1997, and 2000). Although self-efficacy has gained considerable support as an underlying mechanism in the exercise-psychological-well-being literature, improved self-efficacy scores alone do not indicate the criteria on which participants base their self-efficacy responses.

It was suggested earlier mastery experiences related to success contribute to one's perceived self-efficacy. It is now suggested that perceived exercise mastery influences perceived physical ability (self-efficacy) which together with feelings of master and control of one's self and environment contributes to perceived competence. Thus it either directly or indirectly via a sense of accomplishment and satisfaction affects physical and/or global self-concept. Support for perceptions of physical competence being influenced by physical self-perceptions of fitness and body exist (Brown et al., 1995; Kendzierski, Furr, & Schiavoni, 1998). This also makes sense conceptually. One would not feel physically competent without feeling fit enough and with adequate body condition to actually be physically competent.

2.4.3 Perceived Fitness

Perceived fitness includes perceptions of one's aerobic and muscular fitness and endurance as well as body condition and appearance (see Figure 3). These percepts have been shown to be influenced by exercise participation and may underpin self-concept change at the global and/or physical sub-domain level (Nigg & Rossi, 2001). In a number of studies both self-concept and physical self-perceptions improved following exercise treatment (e.g., Finkenberg et al., 1994), whereas in other studies physical self-perceptions improved but no change was found at the global level (e.g., Sorensen et al., 1997). Positive change in physical self-perception of shape, appearance, and fitness following exercise participation has been reported in adult samples of all ages and both sexes (see Table 2, p.19). Perceived change rather than actual change might underpin exercise-induced change in physical self-concept which in turn would affect global self-concept.

2.4.4 Feelings of Accomplishment and Satisfaction

For most people feelings of physical competence contingently lead to a sense of accomplishment and satisfaction. These feelings might positively affect self-concept following exercise (King et al., 1993). Fox (2000) has suggested accomplishment is important for increased self-esteem following exercise. Feelings of accomplishment and satisfaction, following both acute and chronic exercise, have been documented. Ben-Shlomo and Short (1986) found improved satisfaction with self in a sample of young adult females following six weeks of strength training. Whilst in the case of middle-aged and older adults several studies by King and colleagues (1989, 1993) documented increased satisfaction with physical attributes such as appearance, shape, and weight. Feelings of satisfaction and accomplishment would be intrinsically motivating. In an interesting study, conducted on new members of a fitness centre, participants were asked to rate their reasons for continuing to exercise immediately following each exercise session over the

course or their first six months of membership. Feelings of accomplishment (followed by enjoyment) received the highest ratings for those participants who adhered to the exercise prescription of three sessions per week.

2.4.5 Acceptance of one's Physical Self

Acceptance of one's physical self has been found to bolster self-esteem in exercise trials. It might reasonably be assumed to positively affect self-concept following exercise. Sonstroem and Morgan's (1989) Exercise Self-Esteem Model posits a direct link between physical acceptance and global self-esteem. In support, a meta-analysis of exercise effects on self-esteem by McGannon and Spence (2002) found the largest effect size was for physical acceptance (*ES* = 0.38) and smallest for global self-esteem (*ES* = 0.22). However acceptance of the physical self may not have as great an effect on self-concept in older adults who have been found to be more accepting of their physical condition.

2.4.6 Enjoyment

No studies were located in the literature with regard to exercise, enjoyment, and self-concept, but it has been positively implicated in exercise adherence (Wankel, 1993), physical self-definition (Kendzierski et al., 1998), and acknowledged as an important aspect of exercise participation in older adults (Wankel & Berger, 1990). Support is found for enjoyment underpinning exercise motivation in older adults (Stevens et al., 1999), as is socio-psychological well-being (Ashford, Biddle, & Goudas, 1993). It seems reasonable to assume that older women, many of whom live alone, would find exercising with similar others to be an enjoyable experience. Such positive feelings might enhance self-concept.

2.4.7 Time Out or Cognitive Diversion

Time out from the stresses of daily life, that is, distraction from one's problems, or cognitive diversion, may mediate improved mood and the anti-anxiety and antidepressant

effects of exercise because participants find it difficult to ruminate about their problems when they are exercising (Bahrke & Morgan, 1978; Breus & O'Connor, 1998; Glenister, 1996). Following a one-year exercise treatment Emery et al. (1992) found a reduction in worrying in a sample of older adults, mean age 67 years. Reduced anxiety and depression, and improved mood may in turn positively affect self-concept. It has been suggested the antidepressant effect may be the most important beneficial effect of exercise participation (e.g., Landers, 2002; North et al., 1990).

2.4.8 Associative Learning

Reduced anxiety through associative learning may underpin self-concept change following exercise. While exercising, participants experience symptoms normally associated with anxiety, such as sweating, hyper-ventilation, fatigue, palpitation, but do not experience the subjective state of anxiety (Crowne & Marlowe, 1964; Morgan, 1979). Associative learning theory predicts that pairing these symptoms with experiences different from anxiety would eventually cause participants to report less anxiety (Wilson & Davidson, 1971; Wolpe, 1958).

2.4.9 Reduced Anxiety

Reduced anxiety has been reported following and during exercise in non-clinical samples of all ages and both sexes (Landers, 2002) including older adults (Emery & Gatz, 1990). In older women, Lord, Ward and Williams (1996) found regular exercise resulted in significantly improved dynamic postural stability and a reduction in falls. It would be expected that reduced anxiety about falling would enhance perceptions of the physical self in this group. Of further interest, improved sleeping patterns post exercise may mediate psychological benefits such as reduced depression and anxiety, which may in turn positively affect self-concept.

2.4.10 Physiological and Biochemical Change

Anti-anxiety and antidepressant effects of exercise have been hypothesised to be due to improved neurotransmission of norepinephrine, serotonin, or dopamine (Ransford, 1982; Williams & Lord, 1997). It has been hypothesised improved mood associated with exercise is due to increases in endogenous opiates (Steinberg, Sykes, & Morris, 1990; Wolpert, 1995). Research in this area has mostly examined single exercise sessions. It is still not clear whether habitual exercise enhances neurotransmission. Habitual, chronic, exercise has been found to increase endogenous opioid response during exercise (Moore, 1982). However, experimental evidence contradicts theory in this area. Increased opioid levels do not appear to be related to the positive mood found during exercise. It has been suggested that exercise-induced increases in endogenous opioids may actually elevate negative mood more than positive mood (Haier, Quaid, & Mills, 1981). Mood states were found by Williams and Lord (1995) to be normalised in participants who had high initial levels of anxiety, stress, and depression. Initial negative mood was found to increase significantly in these participants, raising their mood to ‘normal’. However, in those with normal or elevated mood initially, non-significant mood increases were reported. The stress hormone cortisol, and thermogenic factors including raised core temperature and reduced muscular tension following exercise have also been proposed to reduce anxiety (Byrd, 1963; deVries, Wiswell, & Moritani, 1981). Reduced negative affective and increased positive affective states following exercise might positively affect self-concept.

2.4.11 Positive Expectations

The role of positive expectations in enhancing the efficacy of exercise treatments may be of great importance. As pointed out earlier, when people self-select to an exercise program they are indicating a desire for change and self-improvement. In one study

Desharnnais (1993) found a group of healthy adults who were led to believe that their exercise program was specifically designed to improve mental wellbeing showed self-esteem significantly improved when compared to controls who were *not* led to believe that the program would be psychologically beneficial. Two studies presented in Table 2, Exercise and Self-concept Review, examined initial expectations (Brown et al., 1995; King et al., 1993). However, when expectancies were controlled for, physical self-perceptions were still found to be improved. These studies did not explore associations between positive expectations and change in physical self-perceptions following exercise in either correlational or regression analyses. This is an area to be further explored.

2.4.12 Experimenter and Experimental Demand

Self concept changes may be influenced by a desire to please or express gratitude to the exercise trainer/instructor/researcher and/or by participants' perceptions of demand characteristics of the experimental situation, especially if they are aware of the study's purpose. In two studies on the effect of exercise on mood, therapist reinforcement was found to have a positive effect (Greist et al., 1979; Powell, 1974). In another study, Hilyer and Mitchell (1979) found the combination of a running and facilitative counselling treatment led to higher gains in self-concept than a running only treatment. Also participants' perceptions of the experimental situation might mediate favourable change in physical self-perceptions due to the intrinsic "get fit" connotations of exercise.

2.4.13 Improved Fitness

A number of authors claim increased fitness underpins psychological improvement following exercise (e.g., McGannon & Spence, 2002; Stewart, King, & Haskell, 1993). However, a larger number of authors claim fitness improvements are not necessary (e.g., Fox, 2000; Lox et al., 2003; McAuley et al., 2000). Supportive evidence for either view is

limited in the exercise-self-concept area. As mentioned earlier, a large number of early studies failed to measure fitness, or failed to report fitness measures, so it is unclear whether real fitness change affected self-concept in these studies. In the exercise-self-concept review conducted for this thesis and based on evidence from the 21 out of 33 studies which measured fitness support was found for an improved fitness-improved self-concept association in 20 of the 21 studies, but only two of these involved older adults.

Once again taking a broader view McAuley and Rudolph (1995) reviewed 23 older adult studies regarding physical fitness and psychological well-being. Although the review found significant improvements in fitness and psychological well-being in the majority of studies they concluded improvements were unrelated; suggested exercise participation may enhance psychological well-being rather than improved fitness. Factors associated with exercise participation may enhance physical self-perceptions such as perceived fitness, body, and physical competence. Perceived change in body and fitness might prove more important to self-concept change than actual fitness improvement in older adults.

2.4.14 Possible Mechanisms Underpinning Self-concept Change Conclusion

The wide range of factors discussed above, give credence to the view that more than one mechanism, each influenced by a number of mediating factors, underpins the exercise-self-concept association. Take for example the exercise setting, a mechanism proposed by this thesis. First, exercise program factors such as positive feedback in the case of the group setting, might positively affect body perceptions and perceived fitness. At the same time actual fitness and somatic change might also affect self-concept either directly or indirectly by its effect on perceived fitness and body. Making it more complex, the degree of influence each factor contributes will be influenced by personality and demographic factors such as age. Overriding this interplay is the importance the individual

places on body, appearance, and fitness. Perhaps the closest we can come to understanding how self-concept is affected by exercise is to examine the inter-relationship among groups of factors in randomised controlled trials, involving specific sub-populations, using detailed treatment protocols which include clearly defined exercise prescriptions.

Both actual and perceived fitness are possible mediating factors. Evidence for the positive effect of actual fitness on self-concept is equivocal. The effect of perceived fitness has received little research attention. The effect of actual and perceived physical change on self-concept needs further investigation. By measuring real fitness and body condition, global self-concept and content-specific sub-domains such as the physical and social, as well as more specific self perceptions such as perceived fitness and perceived body and analysing relationships amongst outcome variables it might be possible to determine whether actual or perceived change is affecting self-concept following exercise. And further, the effect of exercise on physical self-perceptions may differ according to the setting in which the exercise is performed. Self-perceptions of fitness and body may be differentially affected when the exercise is performed in a group setting.

2.5 EFFECT OF THE GROUP: LITERATURE REVIEW

Do some aspects of performing exercise in a group setting affect self-concept and/or physical self-perceptions in a way that would not be expected if the exercise were performed alone? If so, what are the factors involved? As pointed out earlier, the majority of exercise research has been conducted in groups, mostly supervised groups, with very few individual or home exercise treatments, yet the effect of the group on self-concept following exercise performed in a group has received very little research attention to date.

The only study located in the exercise-self-concept review conducted for this thesis which compared two exercise settings (King et al., 1993) as discussed earlier found

no effect of exercise setting when home and group exercise settings were compared (see Table 2). In the physical activity-psychological well-being literature discussed earlier conflicting conclusions have been reached (see Table 21). Some authors suggest the social aspect of exercise is not necessary for psychological change (e.g., Glenister, 1996) yet others claim socialisation accounts for positive effects (e.g., Paluska & Schwenk, 2000).

When exercising in a group, the group setting may provide motivation to maintain exercise intensity throughout individual exercise sessions and to sustain this effort over the duration of the treatment period. It may also provide the necessary climate for social cohesion, social interaction, and positive feedback any of which may positively affect self-concept. As pointed out earlier, the self is socially constructed. That is, we think about appraisals made by others or the 'generalised other' and our perceptions of their opinions of ourself become internalised according to the norms and values of the social group. We also compare our physical selves and our degree of mastery and control of ourselves and our environment to that of others. Certain aspects of the group exercise setting may underpin change in individuals' self-perceptions when they exercise together.

2.5.1 Motivation

Performing exercise in a group has been suggested to be more motivating than exercising alone (Blackman et al., 1988). People are less likely to stop when feeling tired when they are in a group with others observing their behaviour than when they perform similar exercise alone (Serfras & Gerberich, 1984). In addition, the motivation provided by the group to maintain intensity, as well as frequency and duration of exercise would ensure somatic and fitness change, and subsequently be rewarded with increased feelings of accomplishment and satisfaction with oneself. It is reasonable to assume such feelings would be intrinsically motivating. In addition the group also offers opportunities for group

members to compliment each other on achieving fitness and bodily improvements which is likely to further enhance motivation.

2.5.2 Positive Feed-back

Group exercise has been shown to foster explicit and implicit contingent positive feedback. Positive feed-back including approval of others can be communicated in various ways within a group. Mead (1934) placed emphasis on oral communication, whilst Cooley (1912) and Rosenberg (1982) suggest a more perceptual process, and Felson (1993) suggests it is by shared standards and processes of social comparison that we appraise ourselves. Irrespective of how we process the feed-back received, exercise has been found to improve accuracy of perceptions of bodily states (Schwartz and Davidson, 1978) particularly in the group situation. Even so, comparisons can go two ways with individuals comparing themselves either favourably or unfavourably to others. Positive feed-back and positive self-appraisals are assumed more likely, when group members are similarly motivated and experience similar somatic changes. Supporting this view, a group exercise program has been found to become an important source of data to test empirically, analyse logically, and then used to correct self-defeating cognitions of one's body shape and appearance, which may have been misinterpreted or misperceived when exercising alone (Beck et al., 1979). Similarly, social reinforcement may affect physical self-perceptions.

2.5.3 Social Reinforcement

Social reinforcement occurs when exercisers receive praise for their efforts. It may be from the group leader or other group members. It may also be praise indirectly reinforced by the training facility and presence of other motivated exercisers confirming the importance and worth of the self-initiated, positive behaviour. Research suggests that as individuals reinforce others, they are reciprocally reinforced themselves (Lott, 1961).

Regular participation in group exercise sessions may be seen as an example of person-environment interaction promoting positive reinforcement (Lewinsohn, 1982) which would be expected to positively affect self-perceptions. It has further been suggested social acknowledgement may have an indirect affect on self-definition through its effect on perceived ability (Kendzierski et al., 1998). However this would be expected to occur with both group and alone exercise, but perhaps more frequently in a group due to the increased opportunity for social interaction compared to limited interaction alone.

2.5.4 Social Support

Social support may accrue in a group exercise setting as participants form new friendships. People exercising alone may also receive family support but it may not be as effective. A number of studies have been able to differentiate between a variety of forms of social support (Furman & Buhrmester, 1985; Landerman et al., 1989) such as social support of friends, spouse, and relatives. Results suggest friends are more important to people in terms of social support compared to others including family (Dean, Kolody & Wood, 1990; Seeman & Berkman, 1988). There is evidence suggesting support provided by friends and acquaintances is seen as being given freely rather than from a sense of expectation or obligation (Blau, 1975) and is thus assessed more positively by the recipient. Social support offered in a group exercise situation may impact self-concept more positively than support offered in a home setting.

2.5.5 Socialisation

Socialisation may account for psychological well-being according to Norgan (1992) and might account for improved self-concept when exercise is performed in a group setting. In a randomised controlled trial involving older adults McMurdo and Burnett (1992) found increased opportunities for socialisation an important outcome of

group exercise participation. Closely aligned with socialisation, enjoyment has also been implicated as an important factor in group exercise in older adults (Stevens et al., 1999). Of clinical importance the socialising and enjoyment aspects had a positive effect on adherence. Also as mentioned earlier an improved sense of belonging and significance through human contact in the group exercise situation may positively affect self-concept (Fox, 2000) due to the inter-personal context the group provides. The desire to be part of a group is strong for most people. Regard and affiliation are basic human needs.

2.5.6 Inter-personal Context

There is evidence suggesting exercising in a group in new surroundings may foster greater self-concept change than exercising at home in familiar surroundings. As pointed out in Chapter 1, greater shifts in self-concepts by reflection and internalising of behaviour have been reported when the behaviour takes place in new surroundings (Harter, 1999; Jones & Weinhouse, 1979; Kremer & Scully, 1994). In a series of studies, Tice (1992) showed that identical behaviours had greater effect on self-concept when performed publicly than when performed privately. That is, self-concept is more likely to change by internalising public behaviour than by internalising behaviour that is identical but lacks the inter-personal context that a group provides. As well as the social aspect, the group setting provides opportunities for people to work together towards common goals.

2.5.7 Social Cohesion

Social cohesion occurs at both social and task level. The latter refers to setting group goals and working together to achieve them. Bandura (1986) suggests enhanced self-efficacy at the group level leads to loftier goals and increased perseverance in the face of failure or difficulties. On the social level individuals in a group interact verbally with each other and make sacrifices for the group. They experience social support and social

interaction as discussed already. All these factors have been shown to contribute to group cohesion in exercise situations, and in turn to contribute to exercise adherence (Carron, Hausenblas, & Estabrooks, 1999). It seems reasonable to assume positive feelings of group cohesion, strong social ties, mutual trust, reciprocity, and solidarity in a group exercise setting might positively affect perceptions of the self at sub-domain and/or global level. No published self-concept studies examining exercise-social cohesion effects in older adults could be located. Although the social aspect of group exercise may affect self-concept positively it may also have negative effects when bodies are put on show.

2.5.8 Social Physique Anxiety

Social physique anxiety (SPA) refers to the dispositional tendency to become apprehensive about having one's body evaluated in real or imagined social settings (Hart, Leary, & Rejeski, 1989). This has an implication for group exercise and its effect on self-concept, particularly when the exercise is performed in a fitness centre where more revealing clothing is often worn, particularly for obese individuals. Exercise that is performed in the presence of more fit others might compound SPA (Treasure, Lox, & Lawton, 1998). Although this may be the case for younger, it may not be the case for older adults. Treasure et al. (1998) found SPA decreased with advancing age in a sample of middle-aged obese women, compared to younger women, who exercised at a fitness centre in the presence of young fit males. However McAuley et al. (1995) suggest that although people expect to become heavier as they age, thus being overweight becomes more readily acceptable, some people still might be anxious about their bodies being evaluated in a group setting. In summary, group exercise is likely to increase SPA and consequently negatively affect physical self-perceptions and self-concept. However this may not be the case for older women. A related dispositional tendency to SPA is self-

presentation (Leary, 1992). People tend to want to present themselves in the most favourable way, including their body, and thus omit unfavourable aspects, in order to present a desirable image. This could have negative or positive consequences on self-concept when exercise is performed in a group. No evidence could be found in the literature with regard this effect in older women. In younger samples it has been shown to affect exercise motivation (Crawford & Eklund, 1994). There is one final aspect of the group setting to consider, the "get fit" connotation attached to fitness centres.

2.5.9 Attitudinal Change

It has been suggested when people exercise at a group exercise facility they tend to identify themselves with the facility, its fit members and the healthy "get fit" connotations associated with fitness centres (Serfras & Gerberich, 1984). Associative learning predicts that as people attend a fitness centre and exercise in a group with fit people, including the instructors, they perceive themselves to be fitter, healthier, and also, more worthy as a person having undertaken a socially desirable healthful behaviour. It may be assumed such attitudinal change would affect physical self-definitions, physical and personal self-concept, and in turn self-concept in certain exercise settings.

2.5.10 Group Effect Literature Review Conclusion

The literature reviewed above gives credence to the view that the exercise setting could differentially affect self-perceptions when the exercise is performed in a group situation. However, available supportive evidence for many of the suggested mediating factors is suggestive. Strongest evidence is for the positive effect of the inter-personal context and social aspects including cohesion, support, interaction, and reinforcement on physical self perceptions. Certain settings, those with "get fit" connotations, would be expected to exert a strong influence on physical self-perceptions. Only randomised

controlled trials comparing groups of people performing exactly the same exercise in different settings, alone or in a group for example will determine whether or not the exercise setting might differentially affect physical self-perceptions and self-concept. Few studies to date have attempted to do this. In a final attempt to understand the exercise self-concept association it is appropriate to examine relevant theories and models which attempt to explain exercise behaviour and self-concept.

2.6 SOCIAL COGNITIVE THEORIES AND SELF-CONCEPT MODELS: LITERATURE REVIEW

Social learning theory focuses on the individual, environment, and behaviour, underpins the social cognitive framework adopted for this thesis. Social learning theory posits human behaviour can only be understood within the social context in which the individual exists. It assumes human behaviour is best understood as a function of the individual's perception of reality rather than descriptions of stimulus-response (Bandura, 1986; Conner & Norman, 1998). The thinking person, intervening between stimulus and response is regarded as the major factor. Thus all behaviour is cognitively motivated, by perceptions of present behaviour and by perceptions of the expected consequence(s) and/or outcome(s) of that behaviour. How people think and feel about themselves is thus a major, but not the only determinant of human behaviour. A range of social cognitive theories have been proposed. This section asks two questions: Which social cognitive theories best explain exercise behaviour? What model best explains the reported positive exercise-self-concept association?

There are two areas of social cognitive theory. Person perception, that is, how people make sense of others, and self-regulation, that is, how people make sense of themselves. Self-regulation processes are those mental and behavioural processes by

which people enact their self-perceptions, revise their behaviour, or alter the environment so as to bring about outcomes in line with their self-perceptions and personal goals. From this perspective, social cognitive theories explain exercise initiation and maintenance, and how people's perceptions, present and future, of their fitness, body, and competence will affect, or be affected by, exercise participation. Most theories used to explain exercise behaviour are taken from the health behaviour literature. Although all such theories are believed to be accurate, none will fully explain exercise behaviour, but each might explain some part. With these thoughts in mind a review of social cognitive theories follows.

2.6.1 Defining Terms

Cognition defines the way humans use, process and manage information in order to make sense of their world. It includes conceiving, perceiving, remembering, reasoning, planning, decision-making, anticipation, problem-solving including complex rule usage, and construction of images and symbols. *Cognitive Psychology* includes topics such as perception, memory, decision-making, attention, language, and problem solving. *Social Psychology* is the study of social behaviour and experience. *Attributional Social Cognition models* are concerned with individuals' causal explanations of health-related events. They are mainly applied to how individuals cope with and/or respond to certain illnesses rather than health-enhancement. As such they are considered to be not relevant to this thesis. *Predictive Social Cognition models* are used to predict people's future health-related behaviours. Predictive social cognitive models relevant to the present thesis are outlined next. They are grouped according to their main focus: beliefs and attitudes, competence and control, and decision-making.

2.6.2 Belief-Attitude Theories

2.6.2.1 Health Belief Model (HBM)

The Health Belief model, developed by Rosenstock (1974) to predict individuals' preventive health behaviour proposes readiness to take action and engage in health behaviour depends on a number of factors including perception of their own vulnerability (i.e., thoughts about severity and how likely they are to contract an illness). It currently receives a degree of support with regard to exercise initiation but does not adequately explain exercise adherence. For example, it is common to find post-operative coronary patients exercise diligently in the months immediately following surgery, however, for many patients the perception of their own vulnerability tends to wane with time, and exercise participation declines as time from surgery increases. The illness orientation of the HBM does not appear applicable to exercise initiation and maintenance.

2.6.2.2 Theory of Reasoned Action and Planned Behaviour

Theory of Reasoned Action (Ajzen & Fishbein, 1980) proposes intention is the best predictor of behaviour but intention is influenced by beliefs and attitudes. Theory of Planned Behaviour developed from Theory of Reasoned Action when Ajzen (1985) added perceived control as an important factor in behavioural intentions. Theories of reasoned or planned behaviour do not appear to explain variance in exercise behaviour or intentions. Most individuals are aware of the benefits of exercise but for most people this does not translate into exercise initiation and maintenance as current international statistics show.

2.6.2.3 Spontaneous Processes

The belief-attitude theories are deliberative models in which the individual has to weigh up the pros and cons, and may only be applicable when individuals are motivated and have the opportunity to engage in systematic information processing. Spontaneous processes may also influence health behaviour. For example, a model proposed by Fazio (1990) posits conditions such as highly accessible attitudes may guide behaviour through

the selective perception and interpretation of a situation. This process viewed as automatic and does not involve consciously weighing up pros and cons of performing a behaviour. According to Fazio certain environmental cues may trigger behaviour in a spontaneous manner. More work is needed to outline the processes that may underpin a spontaneous or automatic route to health and exercise behaviour (Conner & Norman, 1996). Enjoyment, companions, aesthetics, and "time-out" are possible triggers to be explored.

2.6.3 Competence-Control Theories

These theories, beginning with White's effectance theory (1951) attempt to explain human behaviour via an individual's desire to seek situations in which he/she shows competence and/or has a sense of accomplishment and personal control.

2.6.3.1 Locus of Control Model

Locus of Control Model (Rotter, 1954, 1996) proposes behaviour is a function of individuals' belief that the behaviour will lead to reinforcement (expectancy) and how much that reinforcement is liked. The most important factor in determining expectancies is locus of control. Individuals either perceive reinforcements are within their control or controlled by others, or due to luck, or chance. This is different to self-efficacy which refers to the belief that one is capable of achieving a particular action. It has been argued totally inappropriate for health behaviour (Biddle & Murtrie, 2001; Rogers, 1991) but may be effective for predicting exercise behaviour in the short term.

2.6.3.2 Self-efficacy Theory

Self-efficacy theory contends individuals' beliefs of self-efficacy are central to their decisions to behave in a certain way (Dzewaltowski, Noble, & Shaw, 1990). Efficacy expectations are defined as person's judgements of their capacity to organise and execute skills and resources to perform an action that will lead to a designated outcome (Bandura,

1977). Mastery experiences related to success are believed to be the major influence on self-efficacy according to Bandura. Support for self-efficacy's prediction of physical activity participation has been documented in several studies by McAuley and colleagues. In the area of exercise participation McAuley (1991) proposes a number of interrelated cognitive determinants. He suggests individuals' beliefs regarding perceived capabilities in specific domains influence choice of activity, effort expenditure, and persistence in the face of adversity. This suggests effacious individuals would be more likely to view their exercise participation in a positive manner, feeling more competent, and experiencing a sense of accomplishment and satisfaction with the self. Such feelings would be expected to affect physical self-definition and/or self-concept. But how do we get people to believe they are competent enough to *start* exercising, especially older women, who as a group exhibit less self-confidence with regard physical ability (Lirgg, 1991). This might be achieved by way of influencing their possible or hoped-for selves. Older women need, perhaps with counselling, to see themselves as "an exerciser". This is possible, as demonstrated by Whaley (2003) in middle-aged women as mentioned earlier. In summary, it does appear that feelings of competence, self-efficacy, satisfaction, and sense of accomplishment would boost self-concept. Or is it a feeling of being in control?

2.6.3.3 Self-Determination Theory

Following White's (1959) first effectance (competency) motivation paper which was later developed by Harter (1978), DeCharms (1968) proposed self-determination is a basic human need, and that consequently individuals will be optimally and intrinsically motivated when they perceive themselves to be the origin, or to be in control, of their own behaviour (see also, theory concerning perceptions of personal control proposed by Thill and Brunel, 1995). Deci's (1975) further developed these views, subsequently proposing a

self-determination or cognitive evaluation theory (Deci & Ryan, 1985). It highlights the difference between intrinsic and extrinsic motivations, and assumes individuals are motivated by the urge toward self-mastery and competence. Individuals are intrinsically motivated to perform activities that enhance their sense of accomplishment. According to Deci and Ryan, any outcome that enhances perceived competence will tend to enhance an individual's intrinsic motivation. Alternatively, when extrinsic rewards replace intrinsic factors as the primary reason for engaging in a certain behaviour individuals experience a loss of sense of control. Instead of determining for themselves how and when to exercise for example, they feel controlled and will be less likely to do so.

Activities are intrinsically motivating when there appears to be no apparent external reward except the activity itself. Self-determination theory proposes behaviour is free of restraints, performed out of interest or because it offers a challenge. That is, doing it is enjoyable, not for an end reward or recognition. Self-determination theory holds the key to understanding exercise behaviour. It infers autonomy underpinned by feelings of control, competence, and intrinsic motivation derived from feelings of satisfaction and fulfilment. And further perceived competence can generalise from one specific situation to another. This is termed reciprocal determinism (Bandura, 1977). The influence goes both ways in a specificity-generality upwards model.

2.6.4 Decision-Making Stages of Change Theories

2.6.4.1 Transtheoretical Model (TTM) (Prochaska & DiClemente, (1983)

The TTM of behaviour change proposes individuals progress through a number of stages as they change a behaviour such as exercise initiation, from pre-contemplation to contemplation to preparation and action to maintenance, and termination. Although it is agreed people progress through stages of change one theory alone cannot explain

individual behaviour at all stages. A range of moderators and mediators may be implicated at different stages and during stage transitions (Marshall & Biddle, 2001).

2.6.4.2 Groningen Active Living Model

The Groningen Active Living Model (GALM) was developed for physical activity promotion in older adults in the Netherlands (Stevens et al., 1999). It is a stages of change model with three stages; treatment, implementation, and outcome. It addresses motivation at different stages. A proposed intervening mechanism between treatment and outcome is of interest to this thesis. It is a combination of three mediating factors; perceived fitness, social support, and self-efficacy. These three factors combined are proposed to lead to enjoyment which in turn influences adherence and outcome.

2.6.5 A Multi-Level Ecologic Model

The ecologic model is a promising new development from the field of behavioural medicine (Sallis & Owen, 1999), however, to date, is rarely implemented (Sallis, 2003). Based on the premise that behaviours such as exercise initiation and maintenance are influenced by a wide range of biological, psychological, social, cultural, policy, and environment factors, it posits interventions should also work at all these levels. This is a challenge because it requires a trans-disciplinary paradigm, combining exercise science, behavioural science, urban planning, and other fields. It further requires policy and economic support at local, state, national government levels, and economic support from the business sector. The 10,000 Steps Program is one successful example of a multi-level model changing exercise behaviour at the community level in Rockhampton, Australia (Brown, Eakin, Mummery, & Trost, 2003). Further development and use of this model in exercise research will mark a turning point in our understanding and promotion of physical activity in the general population including older adults (Fuzhong & Brownson,

2005). The interaction of individuals with their environment should be a research priority rather than continually studying either the individual or the environment in isolation.

2.6.6 Self-concept and Self-esteem Models

2.6.6.1 Shavelson, Hubner, and Stanton (1976) Self-concept Model

Shavelson and colleagues provided the first diagrammatic representation of multidimensional hierarchical self-concept whereby self-concept appears at the top and academic and non-academic domains of self-concept branch out below on a middle level. Academic self-concept further branches into specific subject areas (e.g., reading, maths) at a lower level. Non-academic self-concept divides into three sub-domains: social self-concept which further subdivides into relationships with peers and relationships with significant others, emotional self-concept, and physical self-concept which subdivides into physical ability and physical appearance. Further levels of subdivision were hypothesised for each of these specific sub-domains so that at the base of the hierarchy percepts are more closely related to specific behaviour. Shavelson et al. acknowledge the importance of social interaction in self-concept development and change. They define self-concept as a person's perceptions of self formed through experience with his or her environment, influenced by interactions with significant others, and attributions of one's own behaviour The model has stood the test of time, received experimental support, and formed the basis of a number of further models (e.g., Marsh & Shavelson, 1994).

2.6.6.2 Physical Self-perception Model (Fox & Corbin, 1989)

The Physical Self-perception model explains how self-esteem, not self-concept, is affected by physical self-perceptions through enhanced physical self-worth. The model places global self-esteem at the top, physical self-worth at mid-level, and branching out below are perceived strength, body image, sport competence, and conditioning. This

generality-specificity model enables researchers to explore exercise effects on self-esteem. Support for the model was demonstrated by McAuley et al. (1997) when predicted associations between lower-order and higher order factors were confirmed. Using the Physical Self-perception Profile (Fox & Corbin, 1989) based on this model, researchers can measure change at a more exercise-specific level of physical self-concept, namely: perceptions of body image, sport competence, strength, and conditioning.

2.6.6.3 Sonstroem's Exercise Self-Esteem Model (Sonstroem & Morgan, 1989)

The Exercise Self-esteem Model (EXSEM) and the expanded model (Sonstroem et al., 1994) provide a diagrammatic representation of self esteem *change* following physical activity. The model places global self-esteem at the top, physical competence and physical acceptance at the middle level, and physical self-efficacy at the lower level. It assumes exercise first influences physical self-concept such that physical competence/acceptance are enhanced. This subsequently leads to enhanced self-esteem. This is an example of a skill-development model. This view is supported in the literature and is consistent with the hierarchical structure of self-concept proposed by Shavelson et al. (1976) as described above. However, at the same time self-efficacy may also affect physical activity. In this case self-efficacy affects perceived performance which in turn shapes behaviour. In this case the self-enhancement model is supported. Sonstroem et al. (1991) tested the self-efficacy-self-esteem relationship in a sample of adults in their mid and later years. They demonstrated support for the relationship being mediated by physical competence. It is unclear whether such relationships are independent of change in actual fitness and body condition because these variables were not measured.

Support for the structure of the EXSEM was reported in a study by McAuley et al. (1997) and in a meta-analysis by McGannon and Spence (2002) of effect of exercise on

self-esteem where effect sizes were larger for sub-domains relative to global self-esteem. Of added interest the meta-analysis found fitness change had a significant effect on global self-esteem. However, in another test of the model (Sonstroem et al., 1994), psychological scores could not be explained by a corresponding increase in physical scores. In summary, although self-esteem, not self-concept, is the dependent variable in the EXSE model it represents one of the few attempts to understand and systematically test mechanisms underpinning change at the global level of a global self-construct. Development of an exercise-self-concept model is suggested and its relationships then tested experimentally.

2.6.6.3 Skill-development and Self-enhancement Models

These models have been used to explain self-concept change in both educational and exercise research. As mentioned above, increased exercise competence may lead to self-concept enhancement (skill-development model) or alternatively, one's physical self-concept leads to increased competence (self-enhancement).

2.6.6.4 Reciprocal Effects Model

This model developed by Marsh proposes enhanced self-concept will lead to higher achievement, and higher achievement will lead to higher self-concept. This model may also be useful in the exercise field according to findings of Marsh and Perry (2005). It assumes that self-concept not only affects performance and competence but is in turn itself affected by performance/competence. Similarlily, McAuley and Blissmer (2000) contend self-efficacy is not only a determinant of physical activity it is also a consequence of physical activity which they demonstrated with elite swimmers.

2.6.7 Theories and Models Discussion and Conclusion

Before attempting to draw pertinent details from the above theories/models, which might explain self-concept development and change in the realm of exercise behaviour, a

recap is necessary. Most theorists agree, for people to feel good about themselves, they need to experience social interaction, love and regard, feelings of competence, and a sense of mastery, control, and significance (e.g., Baumeister, 1987; Deci & Ryan, 1985; Epstein, 1973; Rogers, 1951). Consequently, people seek situations where these needs can be met. Thus people are motivated to action in areas of their lives in which they are likely to experience positive feelings of competence and esteem. It is reasonable to assume if exercise can meet these needs it will be motivating, and may hold the key to why some people exercise and others do not. This would appear to eliminate belief-attitude models and locus-of-control models involving extrinsic motivation. Only intrinsic motivation is associated with feelings of control and competence. Another basic principle of human behaviour often overlooked in the exercise literature is the pleasure principle. That is, people will seek pleasure and avoid pain, and further, behaviour will be repeated if it is pleasurable. The only model implicating enjoyment as a behaviour moderator was the Groningen model, although enjoyment is implicated in intrinsic motivation. Theory suggests behaviour that is enjoyable and challenging is intrinsically motivating. This has implications for exercise motivation and adherence. First, the exercise prescription should challenge the exerciser. Second, it should be enjoyable. For some people, older women for example, the exercise setting might differentially affect exercise enjoyment.

Sonstroem's (1989) self-esteem model may be applicable to self-concept however it fails to acknowledge the effect of perceived fitness on perceived physical ability (self-efficacy) and physical competence. As shown earlier in Figure 3, this thesis suggests both actual and perceived health-related fitness positively affect self-concept, and further suggests perceived physical competence is a mediating variable between physical self-perceptions (fitness, body) and self-concept. Perceived physical competence is suggested

to comprise feelings of mastery and control, perceived exercise mastery, and perceptions of physical ability (physical self-efficacy). Not all of these pathways can be explored in one study. Thus a model was devised to evaluate effects of actual and perceived body and fitness on physical and global self-concept. The hierarchical structure of self-concept was also illustrated earlier in Figure 2, where situation specific self-referent thoughts can be seen to influence, in turn: physical self-perceptions, physical self-concept, and global self-concept. The preliminary model will be discussed following the present literature review.

Underpinning this thesis, as mentioned earlier, is the view that individuals and their behaviour are both directly or indirectly a function of the environment in which they find themselves. These three interrelated factors, personal, behavioural, and environmental are the basic elements of social-cognitive theory (Bandura, 1986). Studying one without the other will answer only part of any research question with regard human behaviour, including exercise behaviour. Too often in the literature to date individual-centred factors take precedence, and the social environment in which the individual exists is over-looked.

In conclusion, competence-control social cognitive theories appear to offer the best explanation of exercise motivation, with self-determination considered the most viable theory. The Shavelson et al. (1976) model of self-concept best explains the structure of self-concept and Fox and Corbin's (1989) model of physical self-perception best explains the structure of physical self-concept. Thus, social cognitive theory and the models of Fox and Corbin and Shavelson et al. have been used to underpin the present thesis. As mentioned above an exercise-self-concept model has been devised to explain this thesis' hypotheses and will be used in Study 2 Walk Trial to evaluate Hypotheses 1.3.1 to 1.3.3.

2.7 Chapter Two Literature Review Summary

The literature was reviewed in six sections. Before proceeding further, a cut and paste of each section's summary will be presented. A conclusion follows.

2.7.1 Exercise-self-concept literature review. Supporting evidence was found for the reported positive effect of exercise on self-concept. Exercise appears effective in enhancing self-concept in clinical samples and in non-clinical samples of children and adults from the general population and in non-clinical sub-groups experiencing a variety of life circumstances. Although the underlying mechanisms involved are not yet understood, some mediating factors were identified. Effects appear to be greater for exercise treatments of more than 12 weeks duration, and for physical sub-domains of self-concept rather than global. Age appears a mediating factor but not gender.

2.7.2 Self-concept literature review. This review concluded self-concept formation and change is a dynamic process of reflection and internalisation associated with social interaction. Self-concept is multidimensional with a hierarchical structure. A dimension of major importance is the physical self. Other dimensions considered of importance to exercise include social and personal selves. However, whether these and other salient sub-domains are organised into a unified whole or remain a collection of separate selves, remains unclear. This thesis takes the view that one's concept of one's self is for many people, a collection of selves, or schema both consistent and changing. In times such as the present, when social roles are less clearly defined and social values and norms are constantly undergoing rapid change it may be difficult for some people to form an overall theory of self. However, for some people this will be possible. The stability of the social context in which the individual exists is suggested as an important mediating factor. Two areas which may add to our understanding of exercise behaviour are the formation of positive physical self-definitions and hoped for future possible selves.

2.7.3 Benefits of exercise literature review. The physical and fitness benefits of exercise are well documented including sound evidence supporting the view exercise can improve fitness levels in all people including older adults. Exercise offers physical benefits to both clinical and non-clinical groups and those experiencing specific life problems. Risks are minimal and can be avoided with appropriate exercise prescription. Consequently physical benefits of exercise are well promoted. The evidence base for psychological benefit of exercise however has not been universally accepted and thus, not well promoted. This may be due to conceptual problems with terminology, and methodological problems which exist in many early studies in this area. However, despite these problems the present review supports the view that exercise offers psychological (enhanced self-concept) and mental health benefits (reducing but not preventing anxiety and depression) to people of both sexes and all ages including older adults.

2.7.4 Possible mechanisms underpinning self-concept change literature review. The wide range of factors identified in this review, give credence to the view that more than one mechanism underpins the exercise-self-concept association. The literature suggests a large number of factors unrelated to fitness improvement might have a positive effect on self-concept following exercise. Examples of such factors include positive expectations, social-interaction, social cohesion, experimental demand, time-out, positive feedback and reinforcement, associative learning, and attitudinal change. Clearly, a number of these factors apply only to exercise performed in a group setting. The effect of actual fitness improvement on self-concept is unclear, and the role of perceived fitness has received little research attention to date. One possible mechanism affecting self-concept might be the setting in which the exercise is performed, in which case consideration of the interplay of mediating factors of actual and perceived fitness and body change needs to be

explored. The effect of exercise on physical self-perceptions may differ according to the setting in which the exercise is performed. The effect of the group needs to be considered.

2.7.5 Effect of the group literature review. The present review concluded the exercise setting could differentially affect self-concept when exercise is performed in a group. However supporting evidence for the positive effect of many of the possible mediating factors suggested in this section is speculative. Strongest evidence is for the effect of the inter-personal context and social aspects of the group including cohesion, support, interaction, and positive feedback and reinforcement affecting self-perceptions. Physical self-perceptions may be differentially and positively affected, when the exercise is performed in a group setting compared to exercising alone.

2.7.6 Social cognitive theories/models literature review. This section concluded competence-control social cognitive theories appear to offer the best explanation of exercise motivation with self-determination considered the most viable theory. The Shavelson et al. (1976) model of self-concept best explains the structure of self-concept and Fox and Corbin's (1989) model of physical self-perceptions best explains the structure of physical self-concept. The preliminary model used for this thesis will attempt to explain how exercise and the exercise setting affect self-concept via change in exercise-specific self-perceptions. Bandura's social cognitive theory and the models of Fox and Corbin and Shavelson et al. underpin the present thesis.

2.8 Chapter Two Literature Reviews Conclusion

The group exercise setting appears likely to be one mechanism underpinning the positive effect of exercise on self-concept. Only randomised controlled trials comparing groups of people performing exactly the same exercise in different settings will determine whether or not the group setting differentially affects physical self-perceptions and self-

concept. Few studies to date have attempted to do this. Nor has the relationship between actual and perceived body and fitness change and self-concept been investigated. By measuring real fitness and body condition, global self-concept and sub-domains such as the physical and social self, as well as more specific self- perceptions such as perceived fitness and perceived body and analysing interrelationships between change in these variables it might be possible to determine whether real or perceived change and/or the group is affecting self-concept following exercise. Methodological problems discussed in this chapter highlight a critical premise, that within the bounds of possibility, scientific rigour is essential in planning and conducting trials, and interpreting results with regard to exercise effects on psychological variables such as self-concept. In research of this nature to ensure external validity samples from the general population are required and once a group of apparently-healthy participants is identified matching for potential confounding variables and random allocation of participants to experimental and control conditions should be considered mandatory. This should ensure that sound evidence is forthcoming.

2.9 Preliminary Model to Explain the Present Thesis' Hypotheses

A proposed exercise-self-concept model to be used in Study 2 Walk Trial is presented in Figure 4. It comprises variables from the flow chart (Figure 3, p. 43) relevant to this thesis' hypotheses. It does not profess to be a validated model; it is a working model to help explain the present thesis' hypotheses. Similar to Figure 3, it shows several hypothesised pathways between exercise factors and self-concept, and between exercise program factors and self-concept. Pathways to self-concept are shown to be influenced by either actual or perceived change affecting physical self-concept, then global self-concept. Exercise factors are related to the exercise itself; they might influence perceived variables (yellow pathways) and/or actual variables (red pathways). Exercise program factors are

related to participating in an exercise program; they can only influence perceptions (blue pathways). Alternatively, effects of exercise factors and exercise program factors might influence global self-concept directly (see Figure 4a). Also shown (dotted lines) are reciprocal-effects pathways between real and perceived variables; exercise per se will affect physical self-perceptions as participants experience measurable change in their fitness and body in response to the physical exercise and these increased perceptions reciprocally affect exercise performance resulting in further improvement in fitness and body condition. Figure 4 also attempts to show how the effect of the exercise setting, an exercise program factor, might differentially affect physical and global self-concept via change in physical self-*perceptions.* Study 2 will attempt to demonstrate these effects.

In Study 2 Walk Trial, two exercise groups, Alone Walk and Group Walk, will be compared to each other and to a wait-list control group. Exercise per se is hypothesised to influence actual fitness and body measures for both exercise groups, irrespective of whether participants walk alone or in a group because exercise effects will be kept constant by using exactly the same exercise prescription for both exercise groups. Thus, when an exercise program factor e.g., the exercise setting is manipulated, the differential effect on self-concept will be via *perceived* change not real change. It is hypothesised that exercise-induced change in physical self-perceptions will be greater when the exercise is performed in a group setting compared to performing exactly the same exercise alone.

The flow chart presented earlier suggested that perceived physical competence would be influenced by perceived body and fitness, and further that change in perceived competence would positively affect physical and global self-concept via a greater sense of accomplishment and/or satisfaction. Perceived physical competence was suggested to be comprised of a sense of mastery and control, perceived exercise mastery, and perceived

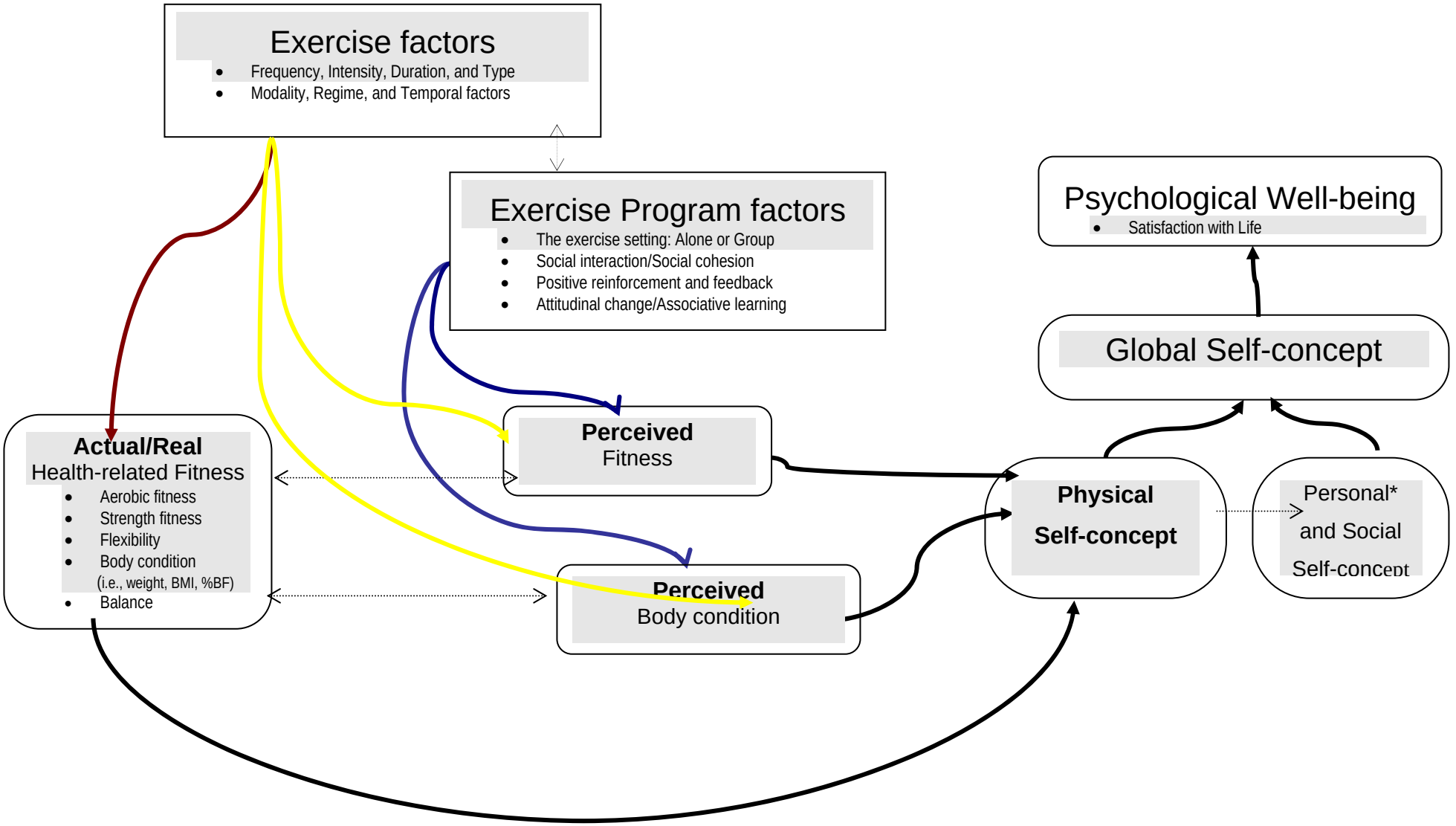

Figure 4. Preliminary exercise-self-concept model to explain the present thesis' hypotheses

Note: Relationships between highlighted variables will be evaluated in Study 2 Walk Trial (see also Figure 4a, page 77)

* Personal self-concept reflects one's view of oneself apart from the body (physical self) and relationships to others (social self).

physical ability (i.e., physical self-efficacy). Although self perceptions of exercise mastery will be measured in Study 2, the effect of perceived physical competence or its suggested components will not be examined in detail in this thesis. A large body of literature exists addressing self-efficacy effects on physical activity at theoretical and experimental levels focusing on motivation and adherence. The focus of the present thesis is exercise effects on self-concept and the effect that the group exercise setting might have on self-concept and physical self-perceptions; specifically, perceived body and fitness.

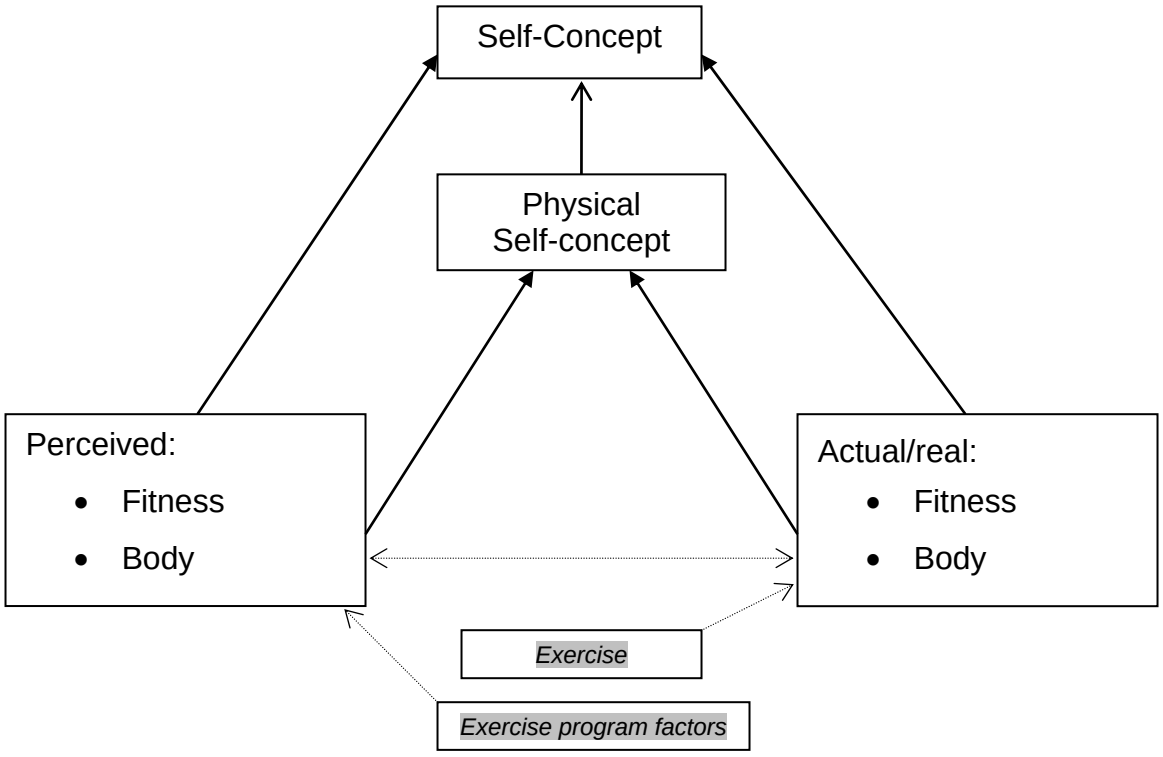

Figure 4a. Relationships, from Figure 4, to be evaluated in Study 2 Walk Trial.

Figure 4a shows the relationships that were highlighted in Figure 4 which will be evaluated in Study 2 Walk Trial. It will measure and compare the effects of actual/real and perceived fitness and body condition on physical and global self-concept. Support for the hierarchical model of self-concept will be confirmed if effect sizes are found to be largest

for specific physical self-perceptions of body and fitness, then smaller for physical self-concept, and smallest for global self-concept. The models presented above address hypothesis 1.3.2 with regard to the differential effect of a 12-week exercise treatment on older women's self-concept when exercise is performed either alone or in a group. They also address hypothesis 1.3.3 with regard to where change occurs, in real or perceived fitness and body, and whether or not perceived change is greater for group exercise. The magnitude of exercise-induced change in self-concept at global, sub-domain, and exercise specific levels will be calculated and the hierarchical structure of self-concept is expected to be confirmed. It is expected both physical and global self-concept will increase for both exercise groups, however, change is expected to be significantly greater for the group exercise condition because social aspects of the group exercise setting are expected to have an additive effect, not present in the alone setting, on physical self-perceptions.

Finally, measures relevant to the model and theory adopted, and to the sample and physical activity to be studied were needed. A hierarchical measure of global self-concept was required that reflected the view that self-concept is comprised of sub-domains of self concept. Thus the Tennessee Self-concept Scale: 2nd Edition (Fitts and Warren, 1996) was chosen for its ability to measure the multidimensionality of self-concept. A measure of physical self-perceptions related directly to exercise was also needed. A review of extant physical self-perception instruments was undertaken and results summarized in Table 22 (Appendix D4). The Self Perception in Exercise Questionnaire (SPEQ) (Sorensen, 1999) was chosen for its ability to measure aspects of self-concept relevant to exercise. To ensure the SPEQ could be reliably used in Study 2 in a sample of older Australian women it was decided to validate and further explore its factor structure on a sample of older Australian women. This was the main purpose of Study 1 to be presented next.

CHAPTER 3: STUDY 1

SELF-REFERENT THOUGHTS IN EXERCISE

Further Validation of the Self Perception in Exercise Questionnaire and a Preliminary Exploration of Older Women's Self-perceptions in Exercise

The Self-perception in Exercise Questionnaire (SPEQ) developed in Norway by Sorensen (1999) is a multidimensional questionnaire to measure perceptions of the self assumed to be important to individuals when they engage in exercise. It covers dimensions already identified in the literature as being important for compliance with, and motivation for, exercise participation. The English version of the SPEQ, which was originally validated on students in the U.S.A., requires further validation before being used on older Australian women. The SPEQ allows researchers to investigate aspects of the self, pertinent to health and fitness, well-being, and exercise adherence. Using four scales, it measures perceptions of, exercise mastery, body condition, fitness, and social comfort or discomfort in the exercise situation, on a level of specificity likely to be affected by exercise participation.

First, a dimension of importance for compliance to exercise is perception of mastery of the task (Sonstroem & Morgan, 1989) or perceived competence (Ryan, Frederick, & Sheldon, 1997) which are also considered to be important for well-being and mental health (McAuley, 1994). Perceptions of mastery and competence are part of other instruments, but the important distinction the SPEQ mastery scale makes is for a more general perception of mastery of an exercise task. The SPEQ mastery scale measures a less stable dimension than extant scales such as the perception of physical abilities (e.g., Messer & Harter, 1986), physical competence (e.g., Richards,1987) and a more exercise-specific scale than sports competence (e.g., Fox & Corbin, 1989; Marsh & Redmayne, 1994). As such it has the added advantage of being more sensitive to change through exercise participation.

Two other important dimensions of self, which are related to exercise, are body image (Sonstroem & Morgan, 1989) and fitness (Plante, 1999). Individuals, especially women, with a negative perception of their body, and those who perceive themselves as unfit, have been found to be less likely to engage in exercise than those with a more positive perception (Fox & Corbin, 1989; Lee, 1999; McAuley, 1994). Body image dimensions are also found in other scales, for example, appearance (Marsh & Redmayne, 1994; Messer & Harter, 1986; Richards, 1987), and bodily attractiveness (Fox & Corbin, 1989), but the SPEQ body scale measures body perception more related to exercise and more generally oriented to the whole body than, for example, Harter's, and Marsh and Redmayne's scales which include satisfaction with specific body parts.

The SPEQ, however, does not focus only on the individual's perception of his/her physical self, but extends to inter-personal perceptions. To date, little consideration has been given to people's concern with the perception others have of them, yet it is a well-known source of social anxiety (Hart, Leary, & Rejeski, 1989), and implicated in self-concept development and change (Hattie, 1992; Hoyle, Kernis, Leary, & Baldwin, 1999). The judgment of others is an important source of self-evaluation, especially when engaging in exercise (Carron, Hausenbas, & Estabrooks, 1999). The SPEQ is noteworthy for inclusion of a social scale, which measures perceived comfort or discomfort in the exercise situation.

The social scale, together with the exercise mastery, body, and fitness scales of the SPEQ should prove useful dimensions for both researchers and clinicians interested in predicting exercise adherence and compliance. The social scale may further prove a valuable tool for exercise physiologists prescribing exercise because it has the ability to predict those individuals who might feel more comfortable in a group exercise setting and those who may feel more comfortable exercising alone.

The SPEQ was originally developed and validated on a sample of young adults (Sorensen, 1997) and subsequently used with a sample of middle-aged adults with elevated risk factors for coronary disease in a randomized controlled trial examining the effect of exercise and/or diet on self-perceptions (Sorensen et al., 1997). Both of these studies used the original Norwegian version of the SPEQ. Although translated into English, and back-translated into Norwegian without reducing content validity when used on an American sample (N = 120) (Sorensen, 1997), the SPEQ requires further cross-cultural validation on a larger English-speaking sample before it can be confidently used in a randomized controlled trial with English-speaking participants.

Its factor structure also needs to be further examined with regard to older adults, particularly older women who currently have the lowest levels of physical activity (Lee, 1999), and who should be the target of future exercise research (Brown & Bauman, 2000). However this population has been neglected in the exercise-self-concept research and in instrument development in particular. With one exception (Chase, 1991), physical self-perception instruments to date have been validated on adolescent and student samples, although a Physical Self-Description Questionnaire (Marsh & Redmayne, 1994) originally validated on adolescents "should be appropriate for adults" (Marsh, Richards, & Tremayne, 1994, p. 276). If validity of the SPEQ is confirmed, its usefulness will be further broadened to include English-speakers, and older adults, women in particular. It should prove a valuable instrument for measuring change in self-perceptions over time in older samples, as well as pre-post change following an exercise treatment. Such change may be shown to be associated with exercise adherence, a more positive self-concept, and satisfaction with life in general. To date, exercise research focusing on older women's physical self-perceptions is extremely limited; one published study (Shaw et al, 2000).

The purpose of this study was thus to determine the cross-cultural validity of the English version of the Self-perception in Exercise Questionnaire (SPEQ) (Sorensen, 1999) on a native English-speaking sample of reasonably large size, further examine its factor structure, and examine its discriminative validity according to participants' exercise status. In addition, this study aimed to further explore older women's physical self-perceptions as a function of their age and body size. No published studies to date have attempted to do so.

Both cross-cultural and discriminative validity of the SPEQ were expected to be confirmed. The same four factors as previously found were expected to emerge with acceptable alpha coefficients. It was expected that women who were currently exercising regularly and those who were physically active would differ in a positive direction from women who were not exercising and from those who were inactive, in their self-perceptions of their fitness, body condition, and exercise mastery, and further that they would feel more comfortable in the exercise situation. It is more difficult to hypothesise with regard to the effect of older women's age and body size on their physical self-perceptions. Research in this area on older women as a group is limited. However, there is some evidence in the literature supporting a positive association between exercise and enhanced physical self-perceptions in older adults, male/female samples (King et al., 1993; Stoll & Alferman, 2002) but gender differences have not always been reported. Studies have not explored age effects within study samples or the effect of body size on self-perceptions in exercise.

3.2 Method

3.2.1 Recruitment, Data Collection, and Response Rate

Packages (N = 315) containing two questionnaires, information sheet, and return postage-paid envelope, were distributed to a wide variety of urban community centres where older women would be expected to attend. A recruitment notice placed at the centre

or the experimenter in person outlined the purpose of the study, procedure, age inclusion criteria, and expected time to complete the questionnaires. Women aged 55 to 85 years were invited to either, complete the survey at the collection point or in their own home, and return the completed questionnaires in the self-addressed postage-paid envelope provided. Return of completed questionnaires would indicate consent to participate. The survey gained ethics approval from the human ethics sub-committee in the School of Psychology, University of New South Wales, Australia. Of the 315 packages distributed over a period of one month, a total of 229 were returned, of which 201 were complete and useable for final analysis, resulting in a total response rate of 73%, and a useable response rate of 64%.

3.2.2 Participant Characteristics

Participants were recruited as outlined above from two large Australian cities resulting in 201 apparently healthy community-dwelling women aged 55 to 83 years (M = 66.13±7.1) volunteering to participate in this study. The age group chosen aimed to be representative of the active retirement years. A majority were Caucasian (95%), were not employed (87%), were well-educated, that is had completed >10 years of schooling (58%), were currently exercising regularly (63%), married/cohabited (60%), and were either over-weight or obese (i.e., Body Mass Index >25) (55%). A small number (6%) identified with an ethnic or cultural group. Table 4 presents demographic and physical characteristics for the study population, including exercise and physical activity levels assessed using data collected on the Exercise Questionnaire. As presented in Table 5, self-ratings of perceived physical activity level, health status, and physical ability were high; 82% and 67% of participants rated their health and physical ability respectively as being either good or excellent and 95% rated themselves as active (i.e., being either very, moderately or slightly active).

Table 4

Characteristics of the Study Population (N = 201): Demographic and Physical

Variables: Self-reported	Response Frequency (%)
Age Group:	
55-64 years	102 (51%)
65-74 years	82 (41%)
75-83 years	17 (8%)
Educational level:	
Primary school	13 (7%)
Secondary school (completed 3-4 yrs)	71 (35%)
Secondary school (completed 5-6 yrs)	21 (10%)
Technical/Business certificate	49 (24%)
Undergraduate degree	33 (16%)
Postgraduate degree	14 (7%)
Marital status:	
Single	9 (4%)
Married	114 (57%)
Separated	3 (1%)
Widowed	51 (25%)
Divorced	18 (9%)
Live with a partner	6 (3%)
Employment status:	
Not employed	174 (87%)
Part-time employed	20 (10%)
Full-time employed	7 (3 %)
Body Mass Index (BMI):	
Underweight (BMI <18)	2 (1%)
Acceptable weight (BMI = 18-25)	85 (42%)
Over-weight (BMI = 25-29)	78 (39%)
Obese (BMI = 30-39)	31 (15%)
Morbidly Obese (BMI >40)	1 (0%)
Missing (weight not reported)	4 (2%)
Variables: Assessed from self-report data:	
Exercise status:	
Exerciser	127 (63%)
Non-exerciser	74 (37%)
Physical activity level:	
Active	129 (64%)
Inactive	72 (36%)

Table 5

Characteristics of the Study Population: Self-rated Physical Self-perceptions

Self Rating	All (N = 201) Response frequency (%)	Exerciser (n = 127) Response frequency (%)	Non-Exerciser (n = 74) Response frequency (%)
Health:			
Excellent	38 (19%)	35 (28%)	3 (4%)
Good	127 (63%)	83 (65%)	44 (59%)
Medium	34 (17%)	7 (5%)	27 (36%)
Fair	2 (1%)	2 (2%)	0 (0%)
Poor	0 (0%)	0 (0%)	0 (0%)
Physical ability:			
Excellent	27 (13%)	25 (20%)	2 (3%)
Good	108 (54%)	81 (64%)	27 (36%)
Medium	39 (19%)	14 (11%)	25 (34%)
Fair	17 (9%)	5 (4%)	12 (16%)
Poor	10 (5%)	2 (2%)	8 (11%)
Physical activity level:			
Very active	31 (15%)	25 (20%)	6 (8%)
Moderately active	148 (74%)	95 (75%)	53 (72%)
Slightly active	12 (6%)	6 (5%)	6 (8%)
Fairly inactive	4 (2%)	1 (1%)	3 (4%)
Very inactive	6 (3%)	0 (0%)	6 (8%)

3.2.3Measures

3.2.3.1 Self-perception in Exercise Questionnaire (Sorensen, 1997)

The 24-item Self-perception in Exercise Questionnaire (SPEQ) designed to measure self-concept variables that are exercise specific, comprises 4 subscales: perception of exercise mastery (MASTme; 8 items), body perception (BODYme; 7 items), perceived fitness (FITme; 4 items), and perception of social comfort or discomfort in the exercise situation (SOCIme; 5 items). Internal consistencies for the four scales were demonstrated by Cronbach alpha coefficients (MASTme 0.7, BODYme 0.84, FITme 0.62, SOCIme 0.7). Thus, all scales revealed adequate reliability. Construct validity was demonstrated with moderate correlations with relatively similar scales (Harter Adult Self-perceptions

Profile) for exercise mastery and athletic ability (r = .54) and body perception and physical appearance (r = .53). Further details of the psychometric properties are reported elsewhere (Sorensen, 1999). The SPEQ has been translated into English and validity confirmed on samples of American students and adults (Sorensen, 1997).

The SPEQ uses a 4-point Likert-type response scale. Response alternatives for each item are: "totally agree, agree to some extent, disagree to some extent, and totally disagree". The item scores range from 1 to 4, with a lower score indicating a more positive self-perception. Mean scale scores are computed from each scale's respective item responses. Each item is formulated clearly as either, an evaluative statement for example "My body looks as good as anyone else's body in my age group" or as an affective response for example "Exercise gives me, among other things, a positive feeling of attaining something". Items that could be expected to give general consent are not used, difficult words are not used, and each item contains less than 20 words. The 24 items, with approximately equal numbers of positively and negatively worded statements have been randomly placed in the questionnaire. To counteract effects of answering style and social desirability, anonymity is assured, and all participants are informed that they may withdraw at any time, and that there are no, right, or wrong answers.

The SPEQ was developed to be self-administered. An explicit set of instructions as to the procedure of answering the items is given to each participant. Participants are asked to respond to each question as to their feelings and perceptions when they exercise which is defined for each participant as: "Physical activity and fitness training that requires a little more systematic effort than just going for a short walk or working in the garden. It may compare to what you know from your physical education classes, taking part in fitness classes, jogging, cross-country skiing or more systematic sports training."

For the present study, a five point scale was used with the addition of a “neither agree nor disagree” response. Item scores thus ranged from (1) disagree to (5) agree, and a *higher* score was used to indicate a more positive self-perception of mastery, body, fitness, and more comfort in the exercise situation. This would facilitate responding to the questionnaires to be used in Study 2; response direction/content would be similar, and thus be easier conceptually for the older sample. In addition, as suggested by Sorensen (1999), for those items containing the phrases “in good shape” or “in better shape”, these phrases were replaced by “fit” and “fitter”, respectively. This was to avoid an ambiguity, which arose when the SPEQ was translated from Norwegian to English. There being no term for the word, “fit”, in Norwegian, the nearest translation was “in good shape” which could be confused with body perception in English-speaking respondents.

3.2.3.2 Exercise Questionnaire

The Exercise Questionnaire (Appendix A1) designed for this study contains 25 items including demographic and background information concerning age, ethnicity, marital status, level of formal education, employment status, and exercise and physical activity engaged in at the moment, self-rated current health status and physical activity level, and rating scales for expectations of exercise and reasons to exercise.

3.2.4. Assessment of Physical Activity Level

Each participant’s level of physical activity was assessed using self-report item responses on the Exercise Questionnaire. Physical activity was defined as “all the physical activity you do in a usual day, this includes time spent at work, on housework, jobs, gardening, walking, shopping, and exercising.” There were three items concerning current level of physical activity (duration, intensity, frequency). Responses comprised number of days per week usually active together with a checklist for the hours/minutes spent being

physical active in a usual day and an average intensity rating of the activity from (1) “NOT at all vigorous or demanding” to (9) “VERY vigorous or demanding” (the terms vigorous and demanding were defined). Participants were assessed as Inactive if they reported being physical active for less than or equal to two hours a day at an intensity rating of 1-4, that is not at all vigorous or to demanding to slightly vigorous or demanding, for most days of the week (no participants reporting this duration rated their intensity higher than a four). Participants were assessed as Active if they reported being active for more than three hours in a usual day at intensity rating of 3-9 (i.e., somewhat vigorous or demanding to very vigorous or demanding), for most days of the week (no participants reporting this duration rated their intensity lower than a three).

3.2.5. Assessment of Exercise Status

Each participant’s current exercise status was assessed using self-report item responses on the Exercise Questionnaire. Exercise was clearly defined, “Exercise is structured physical activity. That is you do it regularly, and have to organize things, or make some plan to do the exercise. Exercise does not include day-to-day physical activities such as housework, shopping or gardening.” A comprehensive list of examples of different types of exercise was also provided. There were six exercise items; are you currently exercising? (Yes/No response), type of exercise (please list), usual weekly frequency in days, average duration in minutes/hours, self-rated intensity for most of the time (1-9), and whether performed in a group or alone. Item responses provided sufficient information to code exercise status (Exerciser or Non-exerciser), exercise setting (Alone or Group), and exercise modality (Aerobic or Non-aerobic). The type (e.g., Tai Chi, walking) of exercise performed was also recorded and frequencies calculated.

3.2.6. Statistical Analysis

Responses were analyzed using principal component analysis with orthogonal rotation. The criterion for acceptance of a factor was a scree plot indicating a "break" in the slope after the initial three factors (Cattell, 1966), an eigenvalue greater than one, and accounting for approximately 5% of the variance. Each item to be included in a factor had to load at least 0.4 on that factor. To test for reliability, all items for each scale were tested in turn. Internal consistency was used as the measure of reliability which was considered high if alpha coefficients reached greater than 0.7. Independent samples *t*-tests were performed on the four scales to test for equality of scale means for Active compared to Inactive participants and Exercisers compared to Non-exercisers. It was expected that the SPEQ would be able to discriminate between exercisers and non-exercisers, and active/inactive respondents. One-way analysis of variance (Bonferroni post hoc) tests were used to determine where SPEQ mean scale scores for Exercisers and Non-exercisers differed as a function of age and BMI group. In order to determine how much of the variance in the SPEQ scales was accounted for by age, body size, and exercise status, multiple regression analyses were performed on individual scales. All data were analyzed using SPSS 13.0. An alpha level of .05 was used in all analyses.

3.3. Results

3.3.1. Participant Characteristics

Characteristics of the 201 older females who participated in this study were presented earlier in Tables 4 and 5. Participants who were engaged in regular exercise for one hour or more per week, (63% of the study population) were classified as Exercisers (n = 127). The remainder who were either not exercising regularly, or exercising for less than one hour per week, were classified as Non-exercisers (n = 74). The most frequently performed type of exercise reported by the Exercisers was walking, followed by group

exercise classes (e.g., Heart Moves, low-impact aerobics, and seniors/gentle exercise). Exercise tasks performed were mostly aerobic (83%) compared to non-aerobic (17%). Exercisers performed their exercise in a group setting more often (57%) than exercising alone (43%). Exercisers were twice as likely to rate their health as good, and 12 times as likely to rate it as excellent, compared to Non-exercisers. A similar trend was found for self-rated physical ability and physical activity/inactivity levels (refer back to Table 5).

Participants' physical activity levels were assessed using self-reported duration, frequency, and intensity of their day-to-day physical activity. A majority (64%) was assessed as Active (n = 129). The remaining participants (36%) were assessed as Inactive (n = 72). Clearly, the ratio of the study population Active:Inactive (64%:36%) closely resembles the Exerciser:Non-exerciser ratio (63%:37%). This similarity was investigated using Pearson product-moment correlation coefficient. A positive relationship was found between Exerciser and Active (r = .48, n =201, p = .01), therefore, no further analyses comparing Active to Inactive group means on any variable were performed. Instead, classification as Exerciser or Non-exerciser was assumed to be synonymous with Active or Inactive respondents.

3.2.2. Factor Structure, Reliability, and Cross-cultural Validity

The 24 items of the SPEQ were subjected to principal components analysis (PCA). Prior to PCA the suitability of the data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of a large number of coefficients of 0.4 and above. The Kaiser-Meyer-Oklin value 0.83 exceeded the recommended value of 0.6 (Kaiser, 1974), and the Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance, supporting the factorability of the correlation matrix. The PCA revealed the presence of five components/ factors with eigenvalues exceeding one, explaining 59.7%

of the variance in total. Inspection of the scree plot revealed a break after the fourth factor. It was decided to retain four factors for further investigation. As the oblique solution is still a subject of considerable controversy (Hair, 1995) only orthogonal rotation varimax with Kaiser Normalisation will be reported. As presented in Table 6, the rotated solution revealed a fairly simple structure with all factors showing a number of strong loadings; with two exceptions all items loaded on only one factor.

The four factors, accounting in total for 55% of the variance, were in accord with previous findings, with the same four scales appearing unambiguously. Conceptually, they represented four variables: perceived exercise mastery (13% of the variance), perceived body (16%), perceived fitness (11.3 %), and perceived social comfort or discomfort in the exercise situation (14.3%). Items loaded on the four scales in a similar way as previous studies with two exceptions and Item 18 ”First and foremost I think exercise is strenuous” did not load on any component. Item 17 which states, “I think I am good at more types of exercise than other people” loaded on fitness (previously on mastery). Internal consistencies were demonstrated by Cronbach alpha coefficients of mastery 0.76, body 0.85, fitness 0.72, and social 0.86. Thus, all scales revealed adequate reliability. In summary, results indicate the validity of the SPEQ on an older female English-speaking sample, if Item 18 is omitted and Item 17 omitted pending rewording and further factor analysis to address an ambiguity.

3.3.3. Discriminant Validity

To determine discriminant validity, it was argued that the four SPEQ scales might be subject to variations with exercise status, for example exercisers are likely to perceive themselves as having better bodies, be fitter, greater mastery, and feel more comfortable in exercise than non-exercisers. The sample was divided into Exercisers, Non-exercisers. As presented in Table 7, the scales were found to discriminate between Exercisers and

Non- exercisers. Independent samples *t* test for equality of scale means found Non-exercisers scored significantly lower on MASTme (mean difference 0.44, $p = .0001$), BODYme (mean diff. 1.32, $p = .0001$), and FITme (mean diff. 0.24, $p = .008$) scales. Although exercisers scored higher on the social scale significant differences were not found between Exercisers (M=3.65±1.11) and Non-exercisers (M= 3.42±0.96).

Table 6

Varimax Rotation of the 4-Factor Solution for the 24 Items of the SPEQ

	Factor 1 Body	Factor 2 Social	Factor 3 Mastery	Factor 4 Fitness
SPEQ Item 9	.723			
SPEQ Item 19	.704			
SPEQ Item 3	.676			
SPEQ Item 8*	.673			
SPEQ Item 22*	.673			
SPEQ Item 23*	.661			.411
SPEQ Item 6	.629			
SPEQ Item 18				
SPEQ Item 16		.830		
SPEQ Item 14		.824		
SPEQ Item 11*		.806		
SPEQ Item 1*		.775		
SPEQ Item 12*		.743		
SPEQ Item 15			.747	
SPEQ Item 5			.719	
SPEQ Item 10			.681	
SPEQ Item 13			.678	
SPEQ Item 20			.672	
SPEQ Item 2*	.409		.466	
SPEQ Item 21				.744
SPEQ Item 24*				.721
SPEQ Item 7*				.700
SPEQ Item 4*				.564
SPEQ Item 17				.481

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Only loadings above .4 were accepted.

* denotes negative items which were scored inversely (see Appendix B2 for SPEQ item statements)

Inspection of the Table 7 mean SPEQ scale scores shows Exercisers consistently had higher self-percepts than Non-exercisers across all 4 scales. Results indicate the SPEQ scales were able to reliably discriminate between older women currently exercising for

more than one hour per week and those who were exercising less frequently or not at all, on perceived body, fitness, and exercise mastery, but not on social comfort or discomfort in the exercise situation.

Table 7

SPEQ Scale Means as a Function of Exercise Status (higher scores are more positive)

SPEQ Scale	Exercise Status	*n*	Mean	*SD*	Between group difference Exerciser vs. Non-exerciser
MASTme	Non-exerciser	74	3.19	0.49	
(range 1-5)	Exerciser	127	3.62	0.39	0.437***
BODYme	Non-exerciser	74	2.87	0.91	
(range 1-5)	Exerciser	127	3.61	0.81	1.324***
FITme	Non-exerciser	74	2.29	0.54	
(range 1-5)	Exerciser	127	2.52	0.64	0.236**
SOCIme	Non-exerciser	74	3.41	0.96	
(range 1-5)	Exerciser	127	3.65	1.11	0.239

KEY: MASTme: Perceived exercise mastery; BODYme: Perceived body condition; FITme: Perceived fitness; SOCIme: Perceived comfort or discomfort in the exercise situation

Note: Independent samples t-test: ** significant at p<.01, *** significant at p<.001

3.3.4. Associations: Self-perceptions in Exercise, Age, Body Size

The sample was divided into three 10-year age groups: 55-64, 65-74, 75-83 years. A series of one-way ANOVAs found significant differences in mean BODYme, $F(2,198) = 3.66$, $p = .027$ and FITme, $F(2,198) = 7.06$, $p = .001$, scales as a function of age. Follow-up Bonferroni post hoc tests found for FITme the oldest group (75-83 years) perceived themselves to be fitter than both the youngest (55-64 years) (mean diff. 0.59, $p = .001$) and the middle group (65-74 years) (mean diff. 0.51, $p = .005$). For BODYme, the youngest group perceived their bodies less positively than the middle group (mean diff. -0.31, $p = .047$). Inspection of Table 8 mean scale scores shows perceived body and fitness increased with increasing age, social comfort in the exercise situation decreased

with increasing age, and exercise mastery was perceived similarly across all ages. With the exception of perceived fitness (see post hoc tests) these can only be considered as observed trends.

Table 8

SPEQ Scale Means as a Function of Age (higher scores are more positive)

SPEQ Scale	Age Group	n	Mean	SD	Between group differences (One-way ANOVA)
MASTme	55-64	102	3.48	.48	No significant
(range 1-5)	65-74	82	3.44	.46	differences
	75-84	17	3.49	.58	
BODYme	55-64	102	3.18	.99	$F_{(2, 198)} = 3.66$
(range 1-5)	65-74	82	3.48	.84	$p = .027$
	75-84	17	3.64	.59	
FITme	55-64	102	2.35	.63	$F_{(2, 198)} = 7.06$
(range 1-5)	65-74	82	2.44	.54	$p = .001$
	75-84	17	2.94	.63	
SOCIme	55-64	102	3.65	1.01	No significant
(range 1-5)	65-74	82	3.51	1.08	differences
	75-84	17	3.27	1.24	

KEY: MASTme: Perceived exercise mastery; BODYme: Perceived body condition; FITme: Perceived fitness; SOCIme: Perceived comfort or discomfort in the exercise situation

Next, the sample was divided into five body size groups according to Body Mass Index (BMI), which was calculated by dividing each participant's weight in kilograms by height in meters squared (kg/m^2), (1) BMI<18 Under-weight, (2) BMI 18-24 Acceptable weight, (3) BMI 25-29 Over-weight, (4) BMI 30-39 Obese, and (5) BMI >40 Morbidly obese. Because of the small number of participants in Groups 1 (n=2) and 5 (n=1), these groups were excluded from further analyses. A one-way ANOVA found significant differences in mean perceived mastery, F (2,191) = 3.23, p =.042, perceived body, F(2,191) = 37.34, p =.0001, and perceived fitness, F(2,191) = 4.07, p = .019. Bonferroni post hoc tests found for MASTme the acceptable weight group had a more positive perception of their exercise mastery than the obese group (mean difference 0.24, p =.056). For BODYme,

acceptable weight group had a more positive perception of their body than both the over-weight and obese groups (mean differences 0.71, 1.32, both *p*s = .0001). The over-weight group perceived their body more positively than the obese group (mean diff. 0.61, $p = .001$). For the FITme scale, the over-weight group perceived themselves to be less fit than the acceptable weight group (mean diff. -0.34, $p = .024$). Inspection of the Table 9 mean SPEQ scale scores indicates perceived mastery, body, and fitness decreased with increasing body size. With the exception of perceived body (see post hoc tests reported above) these can only be considered as observed trends.

Table 9

SPEQ Scale Means as a Function of Body Size (higher scores more positive)

SPEQ Scale	Body Size Group (BMI)	*n*	Mean	*SD*	Between group differences (One-way ANOVA)
MASTme (range 1-5)	Acceptable Weight (18-24)	86	3.54	.43	$F_{(2, 191)} = 3.23$, $p = .042$
	Over-weight (25-29)	77	3.43	.51	
	Obese (30-39)	31	3.33	.51	
BODYme (range 1-5)	Acceptable Weight (18-24)	86	3.84	.68	$F_{(2, 191)} = 37.34$, $p = .0001$
	Over-weight (25-29)	77	3.13	.82	
	Obese (30-39)	31	2.49	.95	
FITme (range 1-5)	Acceptable Weight (18-24)	86	2.57	.63	$F_{(2, 191)} = 4.07$, $p = .019$
	Over-weight (25-29)	77	2.38	.63	
	Obese (30-39)	31	2.22	.45	
SOCIme (range 1-5)	Acceptable Weight (18-24)	86	3.53	1.08	No significant differences
	Over-weight (25-29)	77	3.53	1.04	
	Obese (30-39)	31	3.69	1.10	

KEY: MASTme: Perceived exercise mastery; BODYme: Perceived body condition; FITme: Perceived fitness; SOCIme: Perceived comfort/discomfort in the exercise situation

3.3.5. Regression Analyses

To further explore associations between physical self-perceptions and age, body size, and current exercise status, multiple regression analyses were performed on pre-post change scores on MASTme, BODYme, and FITme scales entering age group, BMI group, and exercise status (Exerciser, Non-Exerciser) into the model. No violations were found on either tolerance or scatterplots. The model accounted for 33% of BODYme variance, 20% for MASTme, and 8% for FITme. Moderate correlations were found between BODYme and BMI (r = .54), between MASTme and exercise status (r = .44), and also between BODYme and exercise status (r = .35). For MASTme the largest standardized Beta coefficient was exercise status (0.44, p = .0001). For BODYme the largest standardized Beta coefficient was body size (0.44, p = .0001) then exercise status (0.23, p = .0001). For FITme all coefficients were less than two (the largest being for age, 0.179, p =.01). Results indicate body size and exercise status account for most of the variance in older women's body perceptions. In summary, exercise status, being assessed as an Exerciser, was found to be the major contributor to feelings of exercise mastery. Exercise status and body size were the largest contributors to body perceptions.

3.3.6 Mean Ratings: Expectations of and Reasons to Exercise

Responses to two questions with regard to expectations of an exercise program and reasons to exercise presented on the Exercise Questionnaire (Appendix B0) were tabulated. As shown in Figure 5, the three most important reasons to exercise were: for my health, to feel good mentally, to get fit. Similarly, the three most likely expectations of an exercise program were: to become fitter, to become healthier, feel better mentally.

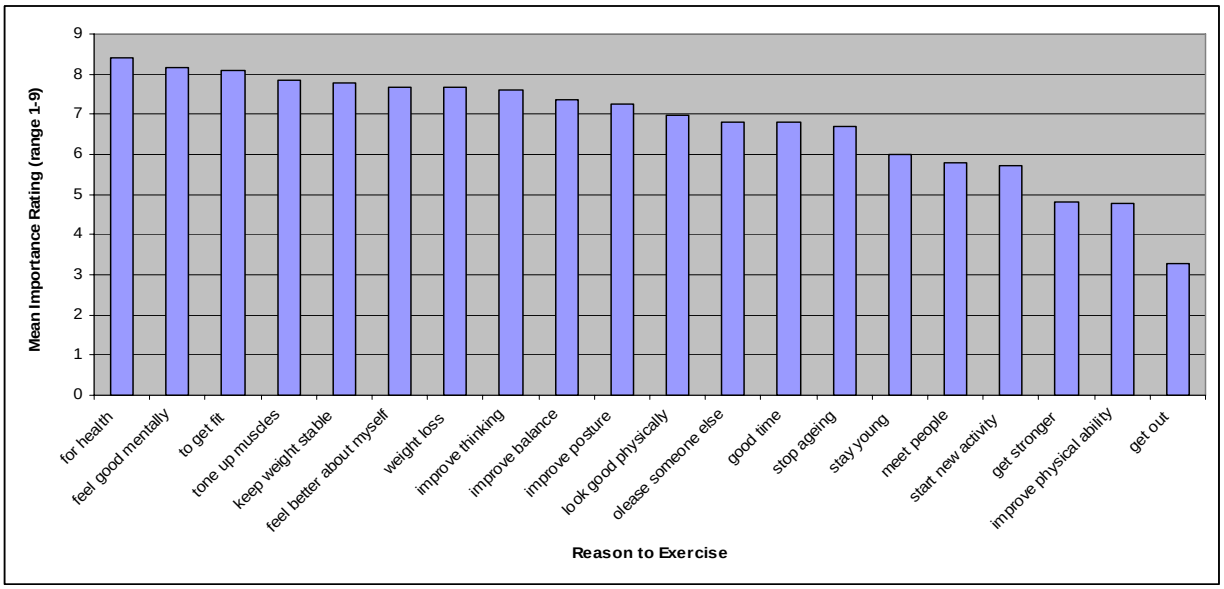

Figure 5. Mean importance ratings for reasons for the older women to exercise (N = 201)

3.4. Discussion

This study describes the validation, including cross-cultural and discriminant, of the English version of the Self-perception in Exercise Questionnaire (SPEQ) (Sorensen, 1999) in a sample of English-speaking Australian women (N = 201) aged 55-83 years, 63% of whom were currently exercising for more than one hour per week and 37% who were exercising less frequently or not exercising at all. It further reports relations found between participants' self-perceptions in exercise and their age, body size, and exercise status.

The major aim of the present study was to investigate whether the four factors previously identified would actually emerge when the English translation of the SPEQ was administered to a sample of older English-speaking Australian women and their responses subjected to factor analysis. Analyses found the same four factors did indeed emerge. As expected, the four scales, exercise mastery, perceived body, perceived fitness, and social comfort in the exercise situation emerged unambiguously with similar item loadings to the original validation studies with the exception of two items (17 and 18). As expected, the

internal consistencies of the derived subscales were all acceptable when assessed with Cronbach alpha coefficients: Body 0.85, Mastery 0.76, Fitness 0.72, and Social 0.86. Discriminant validity was confirmed. The SPEQ demonstrated it was sensitive enough to find differences consistent with former studies and three out of four current expectations. The scales were able to discriminate between individuals who were currently exercising and those who were not in the case of three scales (mastery, body, and fitness) but not for social comfort. In summary, the findings of the present study provide evidence of the cross-cultural and discriminant validity of the SPEQ to measure dimensions of self-concept previously identified as being relevant to exercise.

The first factor that emerged was consistent with body perception (Items 3, 6, 8, 9, 19, 22, and 23). For example, Item 6 states “My body looks as good as anyone else’s in my age group”. It is generally accepted that many individuals exercise to enhance the body and "look good" although there is limited evidence supporting this view in the case of older women. However, on both intuitive and conceptual grounds, the findings reported here strongly suggest this factor may also be salient for older women’s exercise initiation and adherence. Following exercise treatment body self-concept improved in a sample of previously inactive males and females (50^{+} years) (Stoll & Alfermann, 2002) and perceived shape and appearance improved in a similar sample aged 50-65 years (King, Taylor, & Haskell, 1993). In the only published study to date in this area with older women (50-75 years) perceived appearance increased for the women who undertook lower body weight training, but the increase was significant for those low on base-line self-esteem only (Shaw, Ebbeck, & Snow, 2000). This finding may have been due to a ceiling effect as initial values were high, or the type of training used which it seems reasonable to assume would not be expected to positively affect perceived appearance. To further explore associations between

body perception and exercise adherence studies examining change in body perceptions over time are suggested.

The second factor that emerged was consistent with social comfort or discomfort in the group exercise situation (Items 1, 11, 12, 14, and 16). For example, Item 1 states “I prefer doing exercise alone”. This variable has been generally ignored in the exercise literature. Results of the present study support the findings of Hart et al. (1989) and validate this factor as an important one for older women to participate in exercise. Social interaction is important for older women, many of whom may experience social isolation through the loss of a spouse, loss of contact with others through no longer being employed, and family dispersion and “empty nest” in later life. Perceived social comfort in exercise may prove important for health-care professionals considering whether to prescribe exercise alone or in a group setting to maximize adherence. Of course some people prefer to exercise alone and recognizing this aspect is crucial if we wish to enhance the likelihood of older women initiating and maintaining an exercise program. A trend observed in the present study which needs further investigation was, for comfort in exercise to decrease, as age increased. However it must be kept in mind numbers were smaller in the older age groups.

Effective interventions will be those which work at multiple levels, it is not enough to merely tell older people they should “exercise” or “be more physically active”. Exercise behaviour like all human behaviour is complex. It is influenced by psychological, social, cultural, and policy factors, as well as biological and physical factors (Sallis, 2003; Sallis, Bauman., & Pratt, 1998; Satariano & McAuley, 2003). Further research is needed on the social aspect of exercise for older adults including salient exercise settings (Fisher, Li, Michael, & Cleveland, 2003; King et al., 2003). A related factor also overlooked to date is the role of enjoyment in exercise initiation and adherence when older people exercise

together (Berger, 1988; Poole, 2001; Whaley & Ebbeck, 2002) yet it appears important for physical activity adherence in older adults (see GALM model, Stevens et al., 1999).

The third factor that emerged was consistent with exercise mastery (Items 2, 5, 10, 13, 15, and 20). For example, Item 10 states “Somehow, I show how capable I am when I participate in exercise”. This finding is consistent with previous research (Brown et al., 1995; McAuley, 1994), and makes conceptual sense in that many adults do engage in exercise in order to maintain physical skills and competence. This is especially so in the case of older adults, to whom the maintenance of independence is a goal of major importance in later life. For older adults returning to exercise in their retirement years and for previously sedentary adults taking up exercise for the first time it is likely they would feel a sense of mastery and control over themselves and their environment as they lift progressively heavier weights or walk longer distances with less difficulty. This could be intrinsically motivating for individuals who perceive positive change in their exercise mastery. Thus mastery would play an important role in exercise adherence and compliance to exercise prescriptions and as such is an important factor for research investigating self-percepts in exercise in older adults.

The final factor to emerge was consistent with perceived fitness (Items 4, 7, 21, 24). For example, Item 4 states “I am not fit”. This finding is consistent with previous research of King and colleagues (1989, 1993). It also makes conceptual sense because fitness is strongly advocated in health-oriented exercise programs for adults, and is fast becoming a priority with aging adults and the associated rising health care costs, at both an individual and societal economic levels. This factor did not previously emerge in the English language version of SPEQ in which the fitness aspect was apparently lost through the translation process. The present study addressed this issue with changes being made to the previously

translated fitness items and this appears to have made the fitness items more meaningful to respondents in the present study.

The original SPEQ fitness scale comprises only four items. Future research with the SPEQ should develop and explore additional items pertaining to fitness. It is suggested items for future validation should capture dimensions of fitness concerning one's ability to (1) carry out exercise tasks without undue fatigue, (2) have ample energy to enjoy any exercise tasks one chooses to perform, and (3) to still have ample energy for one's normal daily activities following exercise involvement. Such items may not be as relevant to younger adults, but are relevant to middle-aged and older adults and thus make the SPEQ a more useful instrument across a broader age range. Creating new items in future research will determine the efficacy and reliability of the fitness scale of the SPEQ. In summary, the SPEQ scales translated well into English, validity and reliability criteria were acceptable. The factors emerged almost intact demonstrating that the SPEQ may be used to investigate self- perceptions in exercise in English-speaking samples, and with older women.

Two items on the mastery scale, Items 17 and 18 did not appear relevant to older women. It is suggested these items be omitted from the SPEQ when administered to older female samples pending further validation studies. Item 18 "First and foremost I think that exercise is strenuous" did not load on any factor. The concept of exercise being strenuous is apparently not relevant to older women, who are more likely to engage in low-moderate aerobic exercise and non-vigorous or non-demanding physical activity. It is suggested Item 18 be removed (or not scored) when administering the SPEQ to older women. Item 17 "I think I am good at more types of exercise than other people" loaded on fitness. Apparently older women think being good at more types of exercise than other people infers they would need to be fit for this to be the case. It is suggested if it had been worded to include

"compared to other people my age" this ambiguity could have been avoided. Removing one (or two) items from the mastery scale as suggested above should not be problematic; reducing the number of mastery items from eight to six would make the mastery scale more consistent with the other three scales (comprising 7, 5, and 4 items).

Also examined in this study were associations between participants' exercise status, and their self-perceptions in exercise, age, and body size. Two significant findings extend our current knowledge in this under-explored area. First, body perceptions became less positive with increasing body size. This is in accord with findings in younger samples yet does not fit with the commonly held view that older people expect their bodies to decline with age and thus are more accepting of their bodies. The present finding suggests older women still want their bodies to look good and/or be in good condition. This view is supported by the observed importance of body composition (fat tissue mass) to how post-menopausal women viewed themselves in Shaw et al.'s weight training and physical self-concept study (2000). Second, perceived fitness increased with increasing age. This may be explained by older women having lower expectations regarding their fitness thus they rate their limited fitness more highly. Whereas the younger groups still expect to maintain a fair level of fitness and thus rate their fitness lower. The limited literature available precluded predictions being made regarding effect of increasing age and body size on older women's physical self-perceptions. Partial support is found in the literature, as mentioned earlier, self-perceptions have been found to increase following exercise in older adult samples but specific age group and gender effects have not been reported in all of these studies.

As mentioned earlier, perceived mastery, body, and fitness scales discriminated between exercisers/non-exercisers. This was is in accord with current expectations and previous adult studies reporting older exercisers having more positive perceptions of their

fitness and body than non-exercisers (e.g., King et al., 1993; Shaw et al., 2000; Stoll & Alfermann, 2002). However, contrary to expectations, the social comfort scale did not discriminate between exercisers and non-exercisers. The present findings suggest non-exercisers and exercisers perceive their comfort or discomfort in the exercise situation similarly. This suggests health-care professionals prescribing exercise to older women might assure their clients that it is not unusual to feel reluctant to exercise. And further, assure them that most older women feel some discomfort, even those currently exercising, but the positive thing is, that they can be assured that once they start to exercise they will feel better about their body, fitness, and exercise ability. Further investigation is needed in this area on a larger sample, comfort in exercise is an area under-represented in the literature to date yet the present factor analysis suggests it is important to older women.

A limitation of this study is the self-selection of participants. However, similarity of the present study's population to Australian women in general, according to the Australia Bureau of Statistics (ABS) Year Book (2003) statistics for women in the 55-75^{+} years age group for level of physical activity, exercise status, body size, and perceived health, would appear to provide weight to the validity and generalisability of this study's findings. Thirty-six percent of the present study's population (aged 55-83 years) was inactive, and 37% did not engage in regular exercise or exercised for less than one hour per week. According to the ABS Year Book, a total of 32% of the Australia population (31% for males and 32% for females) was inactive (i.e., they did not undertake deliberate exercise, or did so at a very low level). Physical inactivity was highest in older age groups. In earlier life women were more active than men (25-54 years), but following the retirement years (55-64 years) women were far less active than men. In fact 32% of women aged 55-64 years were inactive and this figure rose to 39% at 65-74 years and 55% at 75 years and over.

A further limitation of this study is its reliance on self-report data and associated self-select bias. However their self-rated health, and physical activity levels as mentioned above, were in accord with Australian women in general, 82% of the present study's population rated their health as excellent or good. According to the ABS (2003) year-book statistics the majority of adult Australians consider themselves to be in good health, with 82% rating their health as either, good, very good, or excellent. In addition in the present study 56% of the women, aged 55-74 years were either overweight or obese. According to ABS Year Book (2003) statistics, the proportion of adults who were overweight or obese tended to increase with age, peaking among those aged 55-64 years (59%). This was the case among both males and females (64% and 53%, respectively). The statistics reported above add weight to the present study's validation of the Self Perception in Exercise Questionnaire as a measure of self-perceptions purported to be important for exercise initiation and maintenance in older adults. The findings reported here provide evidence of the validity of the English version of the SPEQ as a measure of these self-perceptions.

In summary, it appears that the SPEQ represents a useful tool for evaluating the relationship between exercise and self-perceptions purported to be important for exercise. The purpose of the present study was to validate the questionnaire as a measure of self-referent thoughts related to exercise participation in a sample of older Australian women. The English version of the questionnaire was found to be specific enough to be affected by exercise experience in this population which confirms previous findings and current expectations that it is general enough to be useful for a range of adult exercise participants including older women. In conclusion, the SPEQ appears to operationalize the self-concept dimensions considered important for exercise studies. The present study also added to our understanding of older women's self-referent thoughts in exercise. Increasing age appears to

positively affect older women's perceived fitness, whereas increasing body size appears to negatively affect body perceptions in this group. Further research using the SPEQ on older samples is necessary to determine its usefulness in exercise research and to increase current knowledge of self-perceptions in exercise in older adults, and in older women in particular.

CHAPTER 4: STUDY 2 WALK TRIAL

EFFECT OF EXERCISE AND THE EXERCISE SETTING ON SELF-CONCEPT

This chapter forms the main body of work for this thesis. Using a randomised controlled pre- posttest design, it examines the effect of exercise and the exercise setting on changes in self-concept following a 12-week exercise treatment of moderate intensity walking. It compares a group of older women exercising in a group to a similar group of women performing the same exercise alone, and then compares both groups to a similarly motivated no-exercise control group. The rationale and hypotheses for this trial were stated earlier in Chapter 1 (p. 7). Briefly recapping hypotheses 1.3.1-2, exercise is expected to significantly affect the self-concept of older women following exercise performed either alone or in a group. The exercise setting is expected to differentially affect self-concept outcomes with effects being significantly greater when the exercise is performed in a group setting. Self-concept is not expected to change for the control group. To examine possible mechanisms underpinning self-concept change a number of other variables will also be measured pre- and post-treatment. These measures include physical, social, personal sub-domains of self-concept, self-perceptions of mastery, body, fitness, and comfort/discomfort in the exercise situation, satisfaction with life and with self, and physiological and fitness measures. Analyses of these variables will allow aspects of the preliminary exercise-self-concept model described in Chapter 2 to be tested and the effect of the group and real and perceived body and fitness on self-concept outcomes to be determined (hypotheses 1.3.3-4).

4.2 Method

4.2.1 Participants

Women were recruited from an urban (Sydney, Australia) community via public notices and the media to take part in this study. Of the 132 women who volunteered to participate 67 met initial inclusion criteria of currently not exercising, aged 55-75 years, obtaining doctor's approval to exercise, and gave informed consent. Participants were matched on age and base-line self-concept then randomised to one of three groups of approximately the same size: Alone Walk (n=23), Group Walk (n=23), and Wait-to-Walk control group (n=21). At the orientation session following randomisation two participants claimed they would be unable to travel to the Group Walk location, even though they had been informed of randomisation. They were subsequently placed in the Alone Walk group.

Descriptive baseline data for the resultant sample of 67 apparently healthy women aged 55-74 years (M = 62.9 ± 5.5) is presented in Table 10. The majority (79%) were overweight/obese (i.e., BMI >25), not employed (64%). Ethnicity was 89% Caucasian (English as first language), and 6% Caucasian and 5% Asian (both English as second language). Percentage of the Australian population English as second language is 12% and female 55^{+} not employed rate is 52% and BMI >25 is 74% (ABS, 2003). The sample was well-educated and this parallels other studies in this area where participants volunteer to exercise (e.g., Blumenthal et al., 1991, King et al., 1993). Mean baseline self-concept of the sample was 282, which is below American adult norms. The 50 t-value for total self-concept on the adult (18-90 years) Tennessee Self Concept Scale is 296-299. The age distribution skewed towards the lower age groups with 21 in the 55-59 year group, 20 in the 60-64 group, and 25 in the two older groups; 65-69 (n= 15) and 70-74 (n=11). In summary, the sample appears representative of Australian women aged 55 plus years.

Table 10

Characteristics of the Study Population at Baseline

Variables	Alone Walk (n = 25) Mean (SD)	Group Walk (n = 21) Mean (SD)	Wait-to-Walk (n = 21) Mean (SD)
Age (years)	62.0 (5.8)	63.1 (5.8)	63.9 (5.1)
Self-concept	283.7 (34.2)	281.9 (26.3)	280.7 (22.8)
BMI (kg/m^2)	28.3 (4.7)	29.9 (4.5)	27.2 (5.5)
%Body Fat	38.1 (6.2)	39.1 (5.7)	36.0 (6.7)
Level of Education (%)	%	%	%
Primary School	4.0	14.3	0.0
Completed 3/4 years high school	24.0	28.6	23.8
Completed 5/6 years high school	12.0	9.5	28.6
Technical/Business Certificate	32.0	19.0	23.8
University Degree	16.0	23.8	14.3
Postgraduate University Degree	12.0	4.8	9.5
Employment Status (%)			
Not employed	60.0	66.7	66.7
Employed Part-time	28.0	19.0	23.8
Employed Full-time	12.0	14.3	9.5
Marital Status (%)			
Single	20.0	9.5	14.3
Married	48.0	42.9	47.6
Partner	8.0	9.5	4.8
Widowed	16.0	23.8	14.3
Divorced	4.0	9.5	19.0
Separated	4.0	4.8	0.0

Participants were included in the final sample if they had completed the posttest, recorded a minimum of 50% of prescribed walking sessions, completed and complied with all aspects of the study protocol, including exercise intensity compliance, and not cross-training or initiating other additional healthful behaviours during the 12-week treatment period. Six participants (M = 60.3 years) dropped out during treatment period (A=1, G=3, W=2) due to personal illness (n = 2) or family/work commitments (n = 2) not related to treatment, and one prior undisclosed knee problem and one no reason given. Thus, the final data set analysed comprised 61 women aged 55-74 years (M = 62.1 ± 5.56) in three

groups of slightly unequal size; Alone (n=24), Group (n=18), and Wait (n=19). The final age distribution was more equitable than at baseline; 55-59 years (n=17), 60-64 (n=19), 65-69 (n=15), and 70-74 (n=10).

4.2.2 Procedure

The following study time profile, Figure 6, provides an overview of procedures.

ETHICS SUBMISSION and APPROVAL

*Submitted 2nd November 2003

8 weeks

1. Submit Ethics application…….*Committee request clarify Dr visit cost issue
2. Gain Ethics approval…….*Approval # HREC 03264 23rd Dec 2003

RECRUITMENT

1. Media releases posted to all local radio and newspapers, resulting in 3 interviews and 4 articles
2. Place advertisements in local community newspaper
3. Place notices around University NSW, local libraries, shopping centres and clubs
4. Post notices to local libraries, clubs and retirement villages during first 4 weeks
5. Recruit 4th Year Health and Sport Science students to serve as Pre- and Post-test assistants

8 weeks

6. As volunteers reply, post general information and Pre-Exercise Medical Screening forms
7. Follow-up by phone non-return of doctor's written approval to exercise
8. Draw up roster for student assistants to help with pre-testing
9. Finalise list of eligible volunteers, confirm by phone then make pre-test appointment
10. Post pre-testing information, how to find us map, parking permit, bus information

PRETESTING 22nd -24th Feb 2004 Individual appointments made for suitable day/ time to attend 2-hour testing session
10 participants, 8 student assistants and experimenter required per session
At University of New South Wales 7 am – 1 pm, 2 test sessions per day plus score questionnaires

1. Gain informed consent, complete pre-exercise and three psychological questionnaires
2. Anthropometric, physiological, and strength measures
3. RPE training on treadmill
4. Rockport 1-Mile Test on grassed area adjacent to testing laboratory
5. Score and record results for all psychological questionnaires

1 week

RANDOMISE and NOTIFY 24th-25th Feb 2004

1. Calculate Total Self-concept scores on TSCS
2. Match participants on age and baseline self-concept then randomise to 3 groups
3. Perform baseline ANOVAS on pretest data
4. Notify participants of group allocations by post
5. Post information regarding attendance at Orientation Day and parking permits

EXERCISE TREATMENT COMMENCES 1st March 2004

ORIENTATION DAY 1ST March 2004

1. All participants meet at the University of New South Wales for 2-3 hours
2. Explain and discuss all aspects of study protocol, safety, and training protocol
3. Read, explain, discuss each page of the Participant Training Manual with question time
4. Trial walk to demonstrate the three phases of each training session and monitoring own RPE
5. Orientation walk recorded as first walk session for Alone and Group Walkers

Weeks 1-12 EXERCISE TREATMENT PROCEDURE

1. Alone Walk participants walk by themselves 3 times per week in a location of their own choice
2. Wait-to-Walk participants maintain normal lifestyle; start a walking program in week after posttest
3. Group Walk participants meet at 7.20 am at UNSW Mon, Wed, Fri, form own groups and walk, stretch with others
4. During the first week the experimenter to attend start of group walks to ensure groups of at least 2 people formed
5. During week 1 experimenter emphasises importance of maintaining own RPE to Group Walkers

Weeks 3, 6, 9 TESTING and MONITORING ADHERENCE

12 weeks

1. Repeated administration of one of the psychological questionnaires (SPEQ)
2. Posted to participants and returned in reply-paid pre-addressed envelope
3. Week 3 post and return with SPEQ first Adherence questionnaire re barriers to exercise

4. Week 9 post and return with SPEQ second Adherence questionnaire re environment
5. Monitoring adherence phone call to all participants on 3-weekly schedule
6. During Week 9 phone all participants re posttest dates and times and make appointment

Weeks 3-12…. MONITOR COMPLIANCE TO PRESCRIBED EXERCISE INTENSITY

1. Make appointment by phone for all experimental participants to attend one session at time of their choice
2. The session is to be treated as a normal training session for that week
3. Polar Advantage Heart Rate monitor worn during the training session
4. Participants advised to ignore it as much as possible and treat this walk as a normal walk
5. Make posttest appointment by phone during Weeks 8-9 according to participant's choice of date
6. Post reminder letter to all participants re posttest date, times Week 11

Week 12…. EXERCISE TREATMENT ENDS

Week 13 POSTTESTING 23rd-25th May 2004 Individual appointments for suitable day and time to attend 2-hour test session
10 participants, 8 student assistants and experimenter required per session
1 week At University of New South Wales 7 am – 1 pm 2 sessions per day

1. Follow same procedure as pretest with exception Post Exercise Questionnaire replaces Pre-exercise Questionnaire
2. Collect Exercise Logs from Alone and Group Walk Participants
3. Ensure Wait-to-Walk participants have Training Manuals, Postcard Calendars, safety guidelines
4. Review training protocol with Wait-to-Walk participants

Week 14… Wait-to-Walk program…commences
12 weeks

1. Wait-to-Walk participants follow Participant Training Manual guidelines
2. Complete 12 week program walking either alone or in a group in location of own choice
7. Experimenter makes phone calls at 3-weekly intervals to ensure safety and maintain motivation
8. Make follow-up testing appointments by phone during Week 20
9. Post reminder letter to all participants re Follow-up Testing date, times Week 26

Week 26…. Wait-to-Walk program …. Ends

Week 27 FOLLOW-UP TESTING 23RD-25TH Aug 2004 Individual appointments made for day, time to attend 2-hour test session
10 participants, 8 student assistants, and experimenter required per session
1 week At University of New South Wales 7 am – 1 pm 2 sessions per day

1. Follow the same procedure as pretest with exception Post Exercise replaces Pre-exercise Questionnaire
2. Wait-to-Walk participants return completed Walking Logs and Postcard Calendars
2. Follow-up questionnaire replaces Post Exercise questionnaire for Alone and Group participants

Week 28 STUDY COMPLETED…Next, analyse data, draw conclusions and mail a summary of results to participants by July 2005

Figure 6. Study time profile

4.2.2.1 Recruitment

Ethics Approval was obtained from the University of New South Wales Human Ethics Committee. Older women were recruited from an urban Australian community in Sydney, Australia to participate in this study. Recruitment, which took eight weeks, was conducted within a 15 kilometre radius of the University of New South Wales, the chosen location for group walks. Notices advertising a free, 12-week moderate intensity walking program for not currently exercising women aged 55-75 years were placed on notice boards in local libraries, shopping centres, retirement villages, and around the University of New

South Wales. Advertisements were placed in community newspapers one of which had a predominantly older audience. Media releases resulted in two radio interviews and four newspaper feature articles which generated the largest number of volunteer inquiries. An overview of recruitment procedure is presented in Figure 7.

Volunteers were advised by phone that they would first be required to complete a Pre-Exercise Medical Screening form (Appendix A1), which may indicate the necessity to obtain their doctor's written approval before joining the program, and then, in the week prior to the program commencing, at the University of New South Wales complete three paper-and-pencil questionnaires and have a fitness assessment. Following these tests, they would be randomly allocated to one of three groups, either (a) exercise three times a week at the University of New South Wales, (b) exercise three times a week in a location of their own choice or, (c) be put on a waiting list for an exercise program to commence in 12 weeks time. This resulted in 132 older women 55-74 years of age volunteering to participate in the study, of whom 49 were excluded for either, exercising regularly for more than one hour per week or because they would be unable to travel to the University of New South Wales three times a week if they were randomised to the group walk condition, or because they did not want to accept possible allocation to the wait-list condition.

Of the 83 potential participants remaining who were sent a medical screening form (with doctor's consent form on reverse side) to complete, 13 did not return the form, 23 did not require their doctor's written consent to exercise, and 47 did require consent, of whom 44 complied. Of the 44 requiring consent, five had a history of heart problems, 29 reported cardiovascular symptoms and/or risk factors, and 37 were taking prescribed medication (these groups are not mutually exclusive). Thus 67 apparently healthy participants met initial inclusion criteria and gave informed consent prior to being pretested.

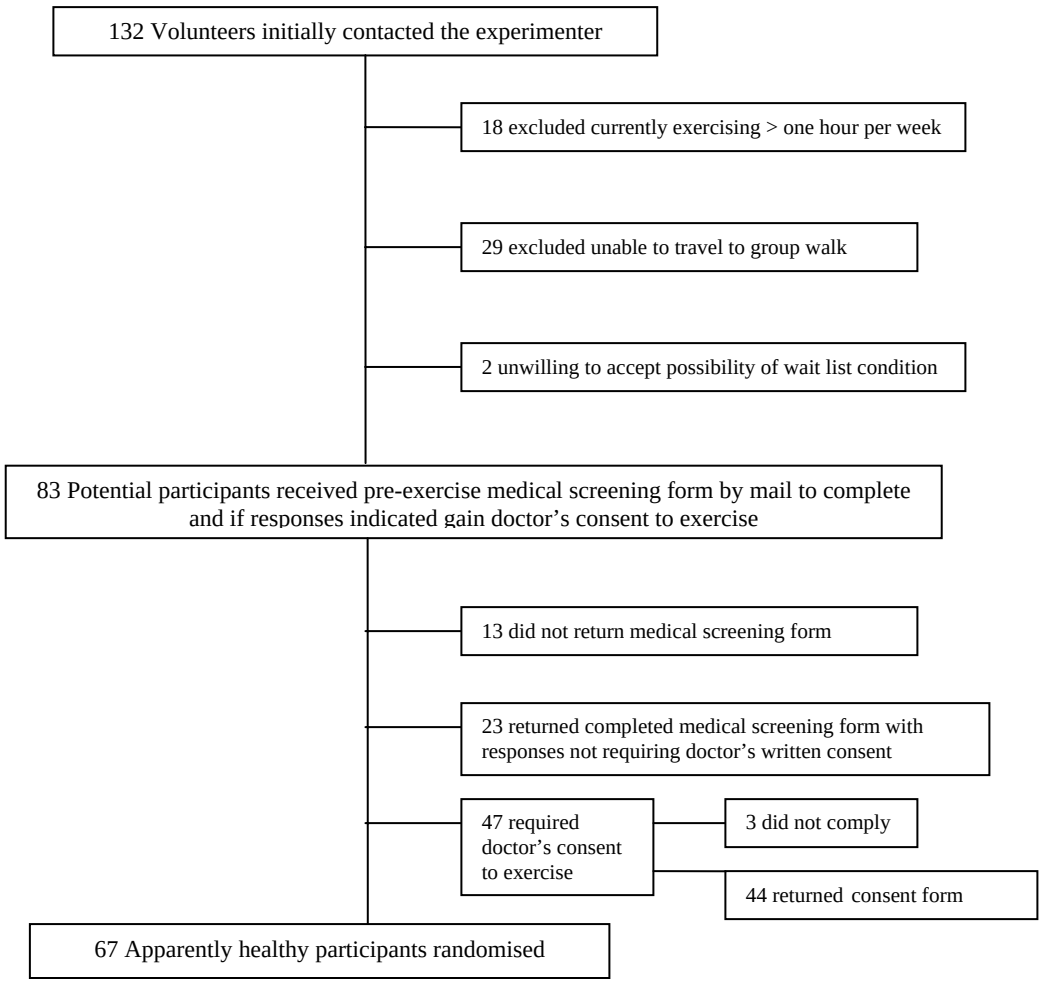

Figure 7. Recruitment time profile

4.2.2.2 Pretest

A pretest was held in the Health and Sports Science Healthy Lifestyle Laboratory at the University of New South Wales, in the week prior to the first week of treatment as outlined in Figure 1 and detailed in Appendix A6. First, participants gave informed consent and completed the Pre-Exercise Questionnaire (Appendix B5). Next, three psychological measures were administered in the following order (1) Satisfaction with Life scale, (2) Self Perception in Exercise Questionnaire, (3) Tennessee Self Concept Scale, all described later.

Next, ten physiological measures were performed. Results were recorded on each participant's Record Card (Appendix A5) which they carried with them from testing station to station. First, anthropometric data was collected in the following order (1) resting heart rate, (2) systolic and diastolic blood pressure, (3) height, (4) body weight, and (5) percent body fat using electrical impedance scales. Body Mass Index (BMI) was calculated later. Strength tests were then administered (1) hand grip dynamometry, (2) leg squat to chair test, (3) graded abdominal test, and flexibility was assessed on a sit-and-reach test. Participants then underwent training in self-monitoring their perceived exertion whilst treadmill walking (zero elevation). This involved the participant walking at progressively increasing speed at ratings of perceived exertion (RPE) of 9, 11, and 13 (Borg RPE 6-20 scale), while their heart rate (HR) and treadmill velocity was recorded.

Figure 8. Participants completing pretest questionnaires

The Rockport 1-Mile Walk test was the last test administered outdoors on a flat grassed area. Each participant wore a Polar HR monitor during the walk. Walk time and HR were recorded immediately at the conclusion of the walk. These measurements along with age, gender, and body weight were used to calculate an estimated VO_{2max}, described later. The entire pretest procedure was completed in two hours. Seven 2-hour sessions were completed over 3 days, Sunday-Tuesday inclusive with either two or three sessions per

day. Ten participants were tested in each 2-hour session by eight 4th Year Health and Sports Science student research assistants under the experimenter's supervision.

4.2.2.3 Randomisation

Following the pretest, in the week prior to the treatment commencing participants were matched on age and base-line total self-concept scores then randomly assigned to one of three groups using computer generated numbers. Three groups of approximately the same size were formed: Alone Walk (A) (n=23), Group Walk (G) (n=23), and Wait-to-Walk control group (W) (n=21). Group allocation was advised by mail and confirmed at Orientation Day at which time two participants, who claimed they would be unable to travel to the Group Walk location, were placed in Alone Walk, resulting in a slightly larger than optimal distribution: Alone Group (A=25, G=21, W=21). Considering the difficulties associated with travelling to a central location, and because it was considered likely that drop-our rates would be higher in Alone Walk (e.g., King et al., 2000), this was considered a reasonable, although not ideal, outcome.

4.2.2.4 Orientation

On day one of treatment a two-hour Orientation session was held for all participants at the University of New South Wales as outlined in Figure 6 and detailed in Appendix A8. All documents necessary for completing the program safely and effectively were distributed and explained. These included (1) Participant Training Manual, (2) Postcard Calendar, (3) Self-Monitoring Intensity, (4) RPE palm-card, (5) Safety Guidelines and Exercise Prescription, and (6) What to do and When to do it (all in Appendix A). Time was allowed for questions. Group participants discussed and chose days/times for walk sessions. A supervised walking session was then performed with instruction in timing an

out-and-back course, timing the three phases of each walk session, monitoring prescribed intensity for each phase, and correct walking and stretching techniques.

4.2.2.5 Posttest

A posttest, which followed exactly the same procedure as pretest, except for a Post- (not Pre-) Exercise Questionnaire, was held in the week following the end of treatment.

4.2.2.6 Follow-up Test

Follow-up testing, which followed exactly the same procedure as pretest, was held in the week following the conclusion of the Wait-to-Walk control group's 12-week walking program. Thus, for the Wait-to-Walk group this acted as a posttest. In addition, four weeks earlier a reminder letter was sent and appointments made for Alone and Group Walk participants who had earlier volunteered at posttest to take part in a follow-up test, which would follow exactly the same procedure as pre- and posttest. Participants were encouraged to attend irrespective of whether or not they had continued to exercise. They were assured their input would provide valuable information regarding maintenance or otherwise of any fitness and mental benefits recorded during the posttest.

4.2.2.7 Protocol for Training in Self-monitoring Exercise Intensity

This procedure, devised for the present study is detailed in Appendix A7. During the pretest session, as mentioned earlier, all participants were administered a 12-minute training session in self-monitoring their exercise intensity at RPE 9, 11,13 on the Borg 6-20 scale. Heart rate and treadmill velocity were recorded as each of the three target levels of perceived exertion was reached. Emphasis was placed on having each participant familiar with what it felt like to be walking at a RPE of 13 which was the prescribed intensity for the conditioning phase of all walk sessions. This procedure was repeated at

post- and follow-up test. Individual changes in heart rate and treadmill speed walking at a RPE of 13 were used as measures of change of each participant's aerobic fitness.

4.2.2.8 Monitoring Adherence and Compliance

For a number of reasons, monitoring adherence to the study protocol and exercise prescription is of great importance in the present study which involved unsupervised exercise for both exercise groups. In most group exercise studies, the intensity of the exercise is controlled and therefore determined and monitored by the exercise instructor (Lee, Jensen, & Oberman, 1996). Also if an accurate dose-response is to be reported it must be demonstrated that participants complied with prescribed intensity. In the present study actual fitness is to be compared to perceived fitness. Therefore, complying with the prescribed frequency, intensity, and duration of sessions aimed at improving aerobic fitness is important, or failure to record a fitness improvement may actually be failure to comply. In addition, two groups exercising in different settings are to be compared.

The presence or absence of other exercisers may differentially affect compliance with the prescribed frequency, intensity, and duration of the exercise sessions in both negative and positive directions. Several dimensions of exercise compliance have been found to affect physiological and fitness outcomes (Robison & Rogers, 1994). The most common dimension reported in the literature is frequency of exercise (e.g., Daltroy, Robb-Nicholson, Iverson, Wright, & Liang, 1995; Williams & Lord, 1995). A second dimension is intensity of exercise because a direct relationship exists between exercise intensity and physiological and fitness outcomes, whereas duration of exercise sessions has not been found to influence adherence. Consequently, considerable effort was made in the present study in training participants in self-monitoring their exercise intensity and participants were asked to keep detailed exercise logs for each session completed together

with a back-up postcard calendar on which sessions completed were recorded. The term adherence will be used from now on to refer to compliance as occurs in the literature.

4.2.*2.9 Exercise Treatment*

Exercise treatment chosen was a 12-week walking program targeting aerobic fitness. Walking is the most frequently performed mode of physical activity in older adults, and in women in particular (ABS, 2003). It can easily be incorporated into most people's activities of daily living, is feasible, familiar, and relatively safe and inexpensive. Each session comprised three phases: a warm-up of slow walking, then a conditioning phase of brisk walking, followed by a cool-down phase of slow walking and static stretching. Frequency was three times a week. Session duration was 40-50 minutes. Exercise progressions are shown in Table 11. The Alone Walk group was required to complete all walking sessions alone in a location of their own choice, preferably in the early morning. Group Walk was required to walk in the grounds of the University of New South Wales, where they would meet and form their own groups, and then walk in a group of two or more. Both Alone and Group Walk sessions were unsupervised. Wait-to-Walk group was asked to maintain their normal lifestyle for 12 weeks after which time they would start a 12-week walking program in a location of their own choice, walking alone or in a group. At Orientation the Group Walk participants elected to meet on Monday, Wednesday, and Friday at 7.30 a.m. They were advised to walk with other participants of similar fitness level to avoid either increasing or decreasing their walking intensity, that is, not walk with others either faster or slower than their own walking pace at their own RPE of 13 for the conditioning phase. All participants were advised to refrain from performing any additional exercise or initiating any other healthful behaviours such as changing eating habits, dieting, or quit smoking, as these actions would confound the study's results.

Table 11

Exercise Treatment Progressions

Training Phase	Weeks		
	1-2	3-4	5-12
Warm-up: Slow walking Low intensity (RPE = 9)	10 minutes	10 minutes	10 minutes
Conditioning: Brisk walking Moderate intensity (RPE = 13)	20 minutes	25 minutes	30 minutes
Cool-down: Slow walking Low intensity (RPE = 9) Stretching (RPE=6)	5 minutes 5 minutes	5 minutes 5 minutes	5 minutes 5 minutes
Total session:	40 minutes	45 minutes	50 minutes

4.2.2.10 Exercise Prescription

Duration, intensity, and frequency were prescribed at levels considered sufficient to raise aerobic fitness of non-exercising women aged 55-74 years. Because the exercise treatment was unsupervised considerable effort was made to ensure participants clearly understood what they had to do and how to do it. An Orientation session was held, RPE training was administered, and a detailed manual and handouts were provided. Exercise prescription was clearly detailed for Weeks 1-2, 3-4, and 5-12 in the Participant Training Manual (Appendix A3, pp.5-7) together with detailed guidelines regarding the three phases of each walking session and how to time a walk session on an out-and-back course (p.3). Stretching exercises were illustrated and instructions detailed in the Training Manual (Appendix A3 pp.9-10) together with stretching safety guidelines.

4.2.2.10.1 Duration. Treatment duration was 12 weeks. Eight weeks has been proposed to be the minimum time necessary for a measurable change in fitness levels (e.g., Egger, Champion & Bolton, 1998; Leith, 1994). To maximise adherence in the present study, 12 weeks was considered a reasonable time-frame to ask participants to commit to group exercise considering their age and the necessity to travel in city traffic. Duration of exercise session was set at 40-50 minutes (see Table 11). This was considered safe and effective whilst not over-taxing the sample of non-exercising older women. A session of 40-50 minutes allowed sufficient time for adequate warm-up and cool-down phases of ten minutes each, and 20-30 minutes for aerobic conditioning. Duration of the conditioning phase was set at 20-30 minutes to ensure an aerobic training effect. For older adults to elicit gains in aerobic power, HR heart rate should reach its optimal target training range of 55-70% of maximum HR (220 minus age) for 30 minutes per session for 3 days per week (ACSM, 2000).

4.2.2.10.2 Intensity. Exercise intensity during the conditioning phase of the walk sessions was prescribed at RPE of 13 on the Borg 6-20 scale (Borg, 1982), which is considered moderate intensity. It falls within the recommended guidelines (RPE 12-16) and for older adults (RPE 12-13) mentioned earlier for improving both health-based and cardiovascular fitness (ACSM, 2000). It was considered a safe and achievable target for the sample of older women (mean age 63 years) in this study. It is claimed that exercising above 85% of maximum HR can over-stress the cardiovascular system (Caspersen, Powell, & Christenson, 1985; Clarke, 1975) and diminish health benefits (Cotton, 1998).

4.2.2.10.3 Frequency. Exercise frequency was three times per week. This was considered a reasonable time commitment to ask of participants to ensure adherence to the study protocol. Considering the initial non-exercising status of participants in this study,

thrice-weekly exercise sessions were considered sufficient to achieve fitness increases (e.g., Stein & Motta, 1992).

4.2.3 Measures

Participants were administered a battery of measures comprising a questionnaire, three psychological and ten physiological measures and tests prior to (pretest) and again following (posttest) the exercise treatment. One of the psychological measures was also administered in Weeks 3, 6, 9. Adherence questionnaires were administered in Weeks 3 and 9. The battery was administered a third time (follow-up test) six months after pretest.

4.2.3.1 Exercise Questionnaires: Information-gathering Forms

4.2.3.1.1 Pre-exercise. A Pre-exercise Questionnaire (Appendix B4) devised for this study was used to screen for exclusion criterion of exercising regularly for more than one hour per week and to collect demographic data on participant age, employment and marital status, and religious and ethnic background. In addition, it asked participants to list their reasons for participating in and expectations of the 12-week walking program.

4.2.3.1.2 Post-exercise. A Post-exercise Questionnaire (Appendix B5) devised for this study was used to screen for exclusion criterion of cross-training (participating in additional exercise above the three 40-50 minute training sessions per week) and/or initiation of any other healthful behaviours. In addition, it collected participants' self reports and comments with regards to any mental and physical changes they may have noticed in themselves over the treatment period and in the case of experimental participants whether or not they thought they would continue to exercise regularly either alone or in a group and to recruit volunteers for follow-up testing in three months time.

4.2.3.1.3 Follow-up. A Follow-up Exercise Questionnaire (Appendix B6) devised for this study was used to collect data on exercise behaviour during the weeks following

conclusion of treatment and to identify participant's self-reported aids, and obstacles/ barriers to exercise.

4.2.3.2 Psychological Measures

4.2.3.2.1 Tennessee Self Concept Scale: 2nd Ed. (TSCS: 2) (Fitts & Warren, 1996). The adult form (18-90 years) of the TSCS: 2 was used to measure pre-post change in self-concept. This frequently used standardised instrument was chosen for its ability to measure the multi-dimensionality as well as the global/total aspect of self concept, and for comparison with previous studies. It measures nine sub-scales and uses the sum of six of these (physical, personal, social, academic/work, family, and moral/ ethical self) to measure total self concept (i.e., global self-concept). The three remaining subscales are supplementary, measuring Satisfaction, Identity, and Behaviour. The widespread use of the TSCS in diverse settings has provided an accumulation of evidence for the validity of the scale as a measure of global/total self-concept and its sub-domains (Fitts & Warren, 1996, p. 61). Internal consistency estimates indicate the TSCS adult form (18-90 years) has adequate reliability with Cronbach's alpha coefficients of: Total self-concept 0.95, Physical self-concept 0.76, and Social self-concept 0.74 (N=1190). Test-retest reliability scores for the adult form, Total 0.82, Physical 0.79, and Social 0.7, are acceptable. A Self Criticism scale provides a measure of veracity and the Faking Good scale is useful for indicating invalid responses. Self-concept was measured using the total self-concept raw score as criterion variable (TOTsc); it is derived from 82 self-descriptive items (Appendix B1). Items are evaluated on a 5-point Likert-type response scale; (1) completely false to (5) completely true. Item 2 for example states "I am an honest person". Six sub-scales, the Physical Self (PHYsc), Personal Self (PERsc), Social Self (SOCsc), Family Self (FAMsc), Academic/Work Self (ACAsc), Moral/Ethical Self (MORsc), and a supplementary scale,

Satisfaction with Self (SATsc) were scored. Higher total and sub-scale scores indicate greater levels of self-conceptions. All scales were scored as both raw scores and t-scores (range 0-100, M = 50)

4.2.3.2.2 Self Perception in Exercise Questionnaire (SPEQ) (Sorensen, 1999). The English version of the SPEQ (Appendix B2) which was validated on older women in Study 1 was used to measure pre-post change in exercise-specific aspects of self-concept, to explore correlations between exercise-induced change in self- percepts at the global and sub-domain level, and also to examine the time course of change in exercise-specific self-perceptions. It was chosen for its ability to measure aspects of self, pertinent to health and fitness, and exercise adherence on a level of specificity likely to be affected by exercise participation and further, because change in physical self-perceptions has been suggested as one mechanism underpinning change at the global level of self-concept. The SPEQ was administered at pre-, post-, follow-up test and by mail during Weeks 3, 6, 9 of treatment. The 24-item Self-perception in Exercise Questionnaire comprises four subscales which are perception of exercise mastery (MASTme), body perception (BODYme), perceived fitness (FITme), and perceived social comfort or discomfort in the exercise situation (SOCIme). Internal consistencies for the 4 scales were demonstrated by Cronbach alpha coefficients (MASTme 0.7, BODYme 0.84, FITme 0.62, SOCIme 0.7). Thus, all scales exhibit adequate reliability. Construct validity was demonstrated with moderate correlations with relatively similar scales (Harter Adult Self-perceptions Profile) for exercise mastery /athletic ability (r = .54) and body perception /physical appearance (r = .53). The SPEQ has been translated into English and its validity confirmed on a sample of native English-speaking college students and adults. Further details of psychometric properties are reported elsewhere (Sorensen, 1999).

Participants respond on a 4-point Likert scale from (1) totally agree to (4) totally disagree. Respective scale items, MASTme (n=8), BODYme (n=7), FITme (n=4), and SOCIme (n=5), are averaged to give a scale score (range 1-4). A lower score indicates a more positive self-perception. Each item is either, an evaluative statement, for example, Item 3 states “My body looks as good as any else’s in my age group” or as an affective response, for example, Item 13 states “Exercise gives me a positive feeling of attaining something”. Items that could be expected to give general consent are not used, difficult words are not used, and each item contains less than 20 words. It has adequate reliability and validity for older women with the exception of Items 18 (omitted) and 17 (reworded) as suggested in Study 1. The SPEQ is self-administered with explicit instructions given to participants who are asked to respond to each question as to their feelings and perceptions when they exercise. Exercise is defined for each participant as, "Physical activity and fitness training that requires a little more systematic effort than just going for a short walk or working in the garden. It may compare to what you know from your physical education classes, taking part in fitness classes, jogging, or more systematic sports training.”

Several changes were made to the SPEQ for the present study. First, a five point scale was used with the inclusion of a “neither agree nor disagree” response, and item responses ranged from (1) totally disagree to (5) totally agree, with a *higher* score indicating a more positive self-perception. This was to facilitate similarity of responding across all questionnaires used in this study (lower to higher) and reduce conceptual confusion, considering the age of the sample. Second, the phrases “in good shape” and “in better shape” were replaced by “fit” and “fitter” respectively, to avoid an ambiguity which arose when the SPEQ was translated from Norwegian to English there being no term for the word “fit” in Norwegian, the nearest translation being “in good shape” which

might be confused with body perception in English-speaking respondents. Third, in line with Study 1's findings, Items 17 and 18 were not scored.

4.2.3.2.3 Satisfaction with Life Scale (SwL) (Diener, Emmons, Larsen, & Griffiths, 1985). The SwL scale (Appendix B3) was chosen for its ability to assess participants' satisfaction with life in general. This short, questionnaire may best be compared to a quality of life scale. It takes only a few minutes to complete. A mean satisfaction score is derived from responses to five items/statements. Participants respond to the five statements on a 7-point Likert-type response scale from (1) strongly disagree to (7) strongly agree. Items 2 and 3 for example state "The conditions of my life are excellent" and "I am satisfied with my life." Item scores range from 1-7 with a higher score indicating higher satisfaction. Respondents are asked to be open and honest in their responses, and are assured of anonymity. Initial and subsequent studies have examined the internal consistency of the Satisfaction with Life scale (SwL) and alpha coefficients have repeatedly exceeded 0.8 (Pavot & Diener, 1993). Test-retest reliabilities have been generally acceptable (original validation r = .82 after 2 months) (Diener et al., 1985). In the present study the SwL was the first questionnaire administered and served as an introduction to Likert-type rating scales for older participants who may not be familiar with this form of responding, and preparing them for the more complex TSCS: 2.

4.2.3.3 Physiological and Fitness Assessment Measures

4.2.3.*3.1 Anthropometric and strength measures.* Anthropometric data collected included height (to nearest cm), body weight (to nearest 0.5 kg), percent body fat using electrical impedance Tanita Scales, and Body Mass Index [weight (kg)/ height (m^2)]. Resting HR and systolic and diastolic blood pressure were measured using an Omron M5 automatic blood pressure monitor. Unusually high or low blood pressure readings were

re-tested with a manual sphygmomanometer. Upper body strength was measured using hand-grip dynamometry (average of two attempts using right and left hands, dominant hand first), lower body strength was measured using a chair-squat functional test for older adults (Appendix C4), and a graded abdominal strength test (Gore & Edwards, 1992) was administered (Appendix C2). Flexibility was measured using best performance on a sit-and-reach test (Wells & Dillon, 1952) described below. Next, aerobic fitness tests were performed. As mentioned earlier maximal oxygen uptake (VO_{2max}) was estimated on the Rockport 1-Mile field test as described below. Economic, time and human resource factors precluded more valid laboratory methods of testing VO_{2max}. As an additional measure of aerobic fitness, pre-post change in treadmill velocity (km/hr) and HR recorded as participants walked at a rate of perceived exertion (RPE) of 13 was used.

4.2.3.3.2 1-Mile walk. The Rockport 1-Mile Walk test (Appendix C6) was used as a measure aerobic fitness. It was chosen because it is suitable for testing large numbers of participants in natural outdoor surroundings similar to treatment conditions and as mentioned above laboratory tests were not possible. It involves measuring the time taken to walk one mile, and heart rate, immediately following the walk. Using the following algorithm (Kline et al., 1987), completion heart rate (HR) and time taken to walk one mile are used to compute an estimate of maximal oxygen uptake:

Estimated VO_2 max (ml/kg/min) =132.853 – 0.16928*body weight in kg – 0.3877*age in years
+ 6.315*gender (0=female, 1=male) – 3.2649*time in min – 0.1565*HR

For this algorithm a multiple correlation of $r = .92$ was reported by Kline et al. (1987) in a study population aged 30-69 years which suggests a 78% likelihood an estimated VO_{2max} will equal actual maximal oxygen uptake. Limitations of this test include individual motivation and self-pacing ability on the test day.

4.2.3.3.3 Sit-and-Reach. A sit-and-reach test (Appendix C5) was used as a measure of flexibility, specifically, anterior trunk flexion. Using a Sportech (Canberra, Australia) sit-and-reach box, with distance equivalent to reaching toe-line set at 35 cm, participants sat on the floor with both legs extended, bare feet together with both feet flat against the box which was set against a wall. Then with legs straight, head down, knees touching the floor, and with extended arms with hands placed one over the other the participant reached slowly forward as far as possible and held for three seconds while position of fingertips was recorded. One warm up was allowed, followed by three trials. Best performance is the flexibility measure recorded.

4.2.3.4 Adherence Questionnaires

4.2.3.4.1 Initial motives. The Pre-Exercise Questionnaire asked participants to list their reasons for joining and any expectations they had for the 12-week walk program. Reasons and expectations were tabulated. During Week 3 an adherence questionnaire devised for this study (Appendix B7) was mailed to all participants asking if they were having difficulty adhering to the program (Yes/No) and to rate their level of adherence; Are you having trouble following the program?, on a 4-point scale from (1) never, to (4) always. Participants answering “No” were asked to rate the two most important reasons for them personally to continue to adhere from a list of eight reasons commonly reported in the exercise adherence literature. “Yes” responders were asked to similarly rate the two most important reasons to themselves personally for missing a walking session. Reasons were tabulated as a function of group and overall. As a veracity check, exercise logs were also collected at this time.

4.2.3.4.2 On-going motives. During Week 9 all participants were sent an adherence questionnaire devised for this study (Appendix B8) asking them to rate four aspects of the

environment which according to Sallis and Owen (1999) affect exercise adherence. Additional adherence data, maintenance of exercise behaviour, was collected on Post-Exercise and Follow-up Exercise Questionnaires. Participants were asked to list (a) obstacles and barriers they met, and (b) what helped them to keep exercising.

4.2.3.5 Monitoring and Measuring Adherence

Exercise Logs, collected at Week 3 and posttest, and Postcard Calendars, returned at time of withdrawal or posttest, were used as primary and secondary measures to collect self-report adherence data on all participants. The logs, described below, were contained in the Participant Training Manual which, because the exercise training in this study was unsupervised contained safety guidelines and detailed instructions for following the study protocol. Instruction and training, including additional handouts (Appendix A11, A12) to complement the manual, were provided at Orientation (Appendix A8). The Postcard Calendar, described below, also contained guidelines and a contact phone number if problems arose at any time. All participants were contacted by phone at 3-weekly intervals to ensure they understood exactly what was expected of them and to ensure that study protocols were being adhered to. On each occasion the experimenter asked, “Are you having any trouble sticking to the program?” and “Do you have any questions?” Participants were advised to contact the experimenter at any future time they had anyquestions or concerns; dates and reasons for dropping out were recorded.

Adherence to the exercise prescription’s frequency, intensity, and duration was monitored using a self-report exercise log described below. Frequency and intensity data from these measures returned at posttest were used to calculate two adherence measures at four points in time (Weeks 3, 6, 9, 12). Adherence to the study protocol, total and per cent sessions completed (totSES and %TOTses) and adherence to prescribed intensity of

RPE of 13 (mean RPE), both of which are assumed to affect aerobic fitness outcomes. This methodology allowed compliance to prescribed frequency and intensity to be analysed over time as a function of group and for combined exercise groups.

4.2.3.5.1 Exercise log. An exercise log (Appendix A3, pp.5-8) or exercise diary, which is a typical methodology used in exercise studies (e.g., Ettinger et al., 1997; King & Senn, 1996) was used by participants following each training session to self-report the time of day they walked, duration of the walk, rate of perceived exertion during the conditioning phase of the walk, and any optional comments. These data were used to monitor duration, frequency, and intensity compliance, and also to compare time of day walked by the Alone Walk group to Group Walk's early morning time of 7.30 a.m. in addition to gathering any additional information participants might provide.

4.2.3.5.2 Postcard calendar. A postcard calendar (Appendix A4) devised for this study was used by all participants as a written reminder of study protocol which was briefly described on one side of the calendar, and as visual reminder of pre- and posttest dates which were marked on the calendar. The calendar comprised 14 weeks (pretest week, 12 weeks of treatment, posttest week). For Alone and Group walkers it also served as an easy-to-use record of sessions completed (simply place a cross on the date a session was completed). Thus it also acted as a back-up to the more detailed Exercise Log. If placed in a prominent position around the home as advised, it would also act as a motivational tool for all participants to aid adherence to the study protocol. Finally, it aimed to collect data on drop-outs; data not usually available for analysis in exercise research. In the event of withdrawing from the study participants were asked to mail the self-addressed post-card back to the experimenter because it would contain valuable information.

4.2.3.5.3 Self-monitoring of exercise with the Borg scale. Participants were trained at pretest in monitoring their own rate of perceived exertion using the Borg 6-20 scale and given practical training at Orientation. In addition, details for monitoring exercise intensity and a copy of the Borg 6-20 Scale explaining the main scale interpretations (e.g., 13 "this is somewhat hard-but it is still OK to continue") were provided in the Training Manual (Appendix A3, p.4), as well as in a RPE hand-out and a smaller RPE palm card to carry during training sessions (Appendix A7). After each training session participants recorded their RPE for the conditioning phase in their exercise log.

4.2.3.5.4 Polar Advantage HR Monitor. During weeks 3-10 each Alone and Group participant was required to complete one training session wearing a Polar Advantage HR monitor. Data recorded at 15-sec intervals were entered into a computer using Precision Performance 2.0 software, and HR at 15-second intervals was graphed to monitor compliance with three distinct levels of intensity for the three phases of the walk. Mean HR for the conditioning phase was calculated. Data collected in individual Exercise Logs were used to calculate a mean RPE across all walking sessions completed over the 12-week training period for each participant. Each participant's mean RPE was converted to corresponding HR (mean RPE multiplied by ten, minus 10) which was then compared to the mean HR from the Polar Advantage monitor to assess compliance with the prescribed intensity of RPE of 13. The HR calculated from the log book mean RPE was also compared to participant's HR while treadmill walking at RPE of 13 recorded at pretest.

4.2.3.6 Safety Measures

During recruitment all volunteers were administered a Pre-Exercise Medical Screening (Appendix A1). Volunteers whose responses indicated a doctor's approval to exercise was required were excluded if written consent was not provided. Guidelines for

safe exercising, what to wear, and correct walking technique were discussed with all participants at Orientation and detailed in the Training Manual (Appendix A3, p.2). A safe and detailed exercise prescription appropriate for the sample included adequate warm-up and cool-down phases of slow walking and static stretching. Intensity was prescribed at a constant level of RPE of 13 on the Borg 6-20 scale during conditioning phase of each training session. Group walkers were advised to walk with participants of similar fitness level. In addition, participants were advised to use the Talk Test.

4.2.3.7.1 Talk test. The talk test is a basic technique to monitor individual exercise intensity at a safe yet aerobically beneficial level (ACSM, 2000). Participants are advised they should be able to talk during exercise. If this is not possible the participant would be considered to be over-exerting and should slow down and exercise at a lower intensity. Stopping completely is not advised unless chest pain, nausea or dizziness is experienced.

4.2.3.7.2 Rating of Perceived Exertion scale (RPE) (Borg, 1982). The RPE scale (Appendix C1) is a simple yet reliable subjective measure for self-monitoring exercise intensity. It has been shown to correlate significantly with more valid monitoring of HR when individuals were asked their perceptions of exercise intensity while exercising wearing a HR monitor (Champion & Egger, 1983). For older female participants in the present study who would be exercising unsupervised an RPE of 13, that is “somewhat hard” on the Borg 6-20 scale, was considered a safe yet aerobically beneficial intensity level for the conditioning phase of the walk sessions. At pretest all participants received treadmill training in monitoring their own exercise intensity at an RPE of 9, 11, and 13. Participants were advised that on the Borg 6-20 RPE scale with 6 representing “no exertion at all” and 20 representing “maximal exertion” they should perceive their exercise intensity during the conditioning phase to be (13) ”somewhat hard”. They were

advised to slow down and exercise at a lower intensity if they perceived intensity to be (14) “starting to feel hard” or (15) “hard”. They were advised that at an RPE of 13 they would be starting to get a sweat up and feeling a little bit puffed but still be able to carry on a conversation. For the warm-up and cool-down phases of each session an RPE of 9 was prescribed. Practical instructions for self-monitoring the rate of perceived exertion were given to all participants at Orientation and detailed instructions and Borg scale were included in the Training Manual (Appendix A3, p.4).

4.2.3.7 Screening Participants for Exclusion Criteria

Screening procedures were used at two stages. The Pre-Exercise Questionnaire screened for initial exclusion of currently exercising for more than one hour per week. The Post-Exercise questionnaire screened for exclusion criteria; (a) initiating any new healthful behaviour or additional forms of exercise, (b) exercise more than prescribed.

4.2.4 Design, Power, Statistical Analysis

A pre-posttest randomised controlled 3 (groups) by 2 (time) design was used. The planned sample size was 60 randomized to three groups of 20. Allowing for a drop-out rate of 30% this would result in a final sample of 42 participants, 14 per group. To detect the expected increase of 10 on the total self-concept raw score on the TSCS, as noted in previous studies in this area (e.g., Perri & Templer, 1985; Wilfrey & Kunce, 1986) a minimum of 12 participants per group would be necessary for adequate power (Cohen, 1988). In order to reduce the proliferation of Type-1 error one-way multivariate analyses of covariance MANOVAs were performed on pre-post difference scores of conceptually similar measures in six domains as presented in Table 12; first with exercise status and then with experimental condition as independent variable to explore the effect of exercise and the exercise setting (alone versus group) on exercise-induced changes in all domains.

Table 12

Psychological and Physiological Domains for Multivariate Analyses

Domain	Variable	Measure/scale to be used
Domain 1: Self-concept	Total self-concept (TOTsc)	TSCS total raw score
	Physical self-concept (PHYsc)	TSCS sub-domain score
	Social self-concept (SOCsc)	TSCS sub-domain score
Domain 2: Self-perceptions	Perceived mastery (MASTme)	SPEQ scale mean
	Perceived body (BODYme)	SPEQ scale mean
	Perceived fitness (FITme)	SPEQ scale mean
	Perceived social comfort (SOCIme)	SPEQ scale mean
Domain 3: Satisfaction	Satisfaction with Life	SwL
	Satisfaction with self (SATsc)	TSCS supplementary scale
Domain 4: Fitness (Aerobic)	Estimated VO_{2max}	Rockport 1-Mile walk
	Treadmill walking speed at RPE of 13	Intensity training
Domain 5: Fitness (Strength)	Upper body strength	Hand grip
	Lower body strength	Leg chair squat
	Abdominal strength	Graded sit-up
Domain 6: Fitness (Body)	Body weight	
	Body Mass Index	
	Percent body fat	Tanita scales
	Flexibility	Sit-and-reach
	Resting HR	
	Blood pressure diastolic	
	Blood pressure systolic	

KEY: SPEQ Self Perception in Exercise Questionnaire; SwL Satisfaction with Life Scale; TSCS Tennessee Self Concept Scale

Because of the sample's wide age range two-way between-group MANOVAs with four age groups (55-59, 60-64, 65-69, and 70-74 years) were performed to explore main effects and interactions in each domain. When initial analyses indicated significant differences at baseline, analyses of covariance, ANCOVAs, were performed on difference scores using pretest scores as covariate. When significant MANOVA differences were found, one-way analyses of variance, ANOVAs, using Bonerroni post hoc tests were conducted. Finally, effect sizes were calculated on difference scores using the algorithm:

(Experimental mean – Control mean) /pooled standard deviation

Where $SD_{pooled} = \sqrt{[(n_e - 1)\, SD_e^2 + (n_c - 1)\, SD_c^2] / (n_e + n_c)}$

To explore possible mechanisms underpinning exercise-induced change in self-concept Pearson moment correlations were calculated between global and physical self-concept, between both global and physical self-concept and real and perceived fitness and

real and perceived body condition, and between physical self-perceptions and satisfaction with life and self. Multiple regression analyses were used to determine the amount of variance in self-concept following exercise accounted for by real and perceived body and fitness. Change in self-perceptions over time for alone and group exercise were explored using multivariate and paired-sample *t*-tests. Correlations between adherence and fitness and psychological outcomes, as well as adherence and baseline demographic variables were calculated. An alpha level of .05 was used throughout unless otherwise indicated. With exception of effect sizes, all statistics were computed using SPSS.13 software. For brevity, partial eta squared results will be reported simply as ε^2 and Wilks's lambda as λ.

4.3 Results

The results are presented in five major sections. Section 1 presents an analysis of baseline data and summary pre-posttest statistics for all dependent variables. Section 2 presents multivariate and univariate analyses of treatment outcomes, examining the effect of exercise and the exercise setting on all psychological and physiological variables. Section 3 explores possible mechanisms underpinning exercise-induced changes in self-concept. Section 4 examines adherence issues including the effect of the group setting. Section 5 summarises results and presents effect sizes for significant treatment outcomes.

4.3.1 Results Overview

The three groups Alone Walk, Group Walk, and Wait-to-Walk were found to be similar demographically, physiologically, and psychologically prior to exercise treatment. A series of one-way ANOVAs found no significant differences between mean group baseline (pretest) scores for any measures. Tables 13 and 14 provide an overview of each group's mean pretest, posttest, and pre-post change scores on all psychological and

physiological measures respectively, together with pre-post paired-samples *t*-test results which show significance of exercise-induced change in all variables for each group.

4.3.2 Multivariate and Univariate Analyses of Treatment Outcomes

This section examines the effect of exercise and the exercise setting on self-concept, physical self-perceptions, satisfaction with life/self, and physiological variables. Significant findings are summarised and presented in Tables 15 (Exercise vs. No-exercise) and 16 (Alone Walk vs. Group Walk vs. Wait-to-Walk). Summaries of *all* this section's findings are presented in Tables 15a and 16a in Appendixes D1 and D2, respectively. Preliminary assumption testing was conducted to check for normality, linearity, uni- and multi-variate outliers, multicollinearity, and homogeneity of variance-covariance matrices. Results of these tests will only be reported where violations are found.

4.3.2.1 Self-concept

4.3.2.1.1 Effect of exercise on self-concept: Exercise vs. No-exercise. A one-way between-groups MANOVA was performed to investigate the effect of exercise on self-concept. Three dependent variables were used: pre-post difference scores in total self-concept (dif1TOTsc), physical self-concept (dif1PHYsc), social self-concept (dif1SOCsc) scales from the Tennessee Self Concept Scale (TSCS). The independent variable was exercise status: Exercise (A+G) and No-exercise (W). A statistically significant difference was found between Exercise and No-exercise on the combined dependent variables: $mF(3,57) = 3.03$, $p = .037$, $\lambda = .86$, $\varepsilon^2 = .14$. Total and social self-concept change scores violated assumption of equality of variances. Therefore, a more conservative alpha level of .025 was used for these variables in subsequent analysis of group differences in individual dependent variables (Tabachnick & Fidell, 1996, p. 80).

Table 13

Overview of Psychological Outcomes: Mean pretest, posttest, and pre-post change scores, SDs, and pre-post paired-samples *t*-test results by group

Psychological	Alone Walk						Group Walk						Wait-list Control					
Measures	Pre (n=25)	Post (n=24)	Change	SD	*t*-value	*p*	Pre (n=21)	Post (n=18)	Change	SD	*t*-value	*p*	Pre (n=21)	Post (n=19)	Change	SD	*t*-value	*p*
Total Self Concept (TSCS)(range82-410)	283.67	290.67	5.750	13.228	2.130	.044 *	281.86	294.61	15.389	16.922	-3.858	.001 **	280.67	281.68	-0.105	9.036	-0.122	.904
Physical Self Concept (TSCS) (range14-70)	49.24	50.29	0.833	4.341	-0.941	.357	43.33	51.28	5.611	5.669	-4.200	.001 **	48.95	48.42	-0.526	3.732	0.615	.546
Moral Self Concept (TSCS) (range12-60)	51.13	51.67	0.542	4.625	-0.574	.572	50.89	52.39	1.500	6.176	-1.030	.317	49.32	50.00	0.684	1.797	-1.660	.114
Personal Self Concept (TSCS)(range12-60)	46.50	47.83	1.333	3.447	-1.895	.071	47.39	48.94	1.556	4.119	-1.602	.128	46.83	47.89	1.053	2.896	-1.584	.131
Family Self Concept (TSCS)(range12-60)	47.04	48.38	1.333	4.007	-1.630	.117	47.17	49.28	2.111	4.391	-2.040	.057	46.89	47.16	0.263	2.330	-0.492	.628
Social Self Concept (TSCS)(range12-60)	47.92	49.38	1.458	4.054	-1.762	.091	46.39	49.39	3.000	4.627	-20751	.014 *	45.84	45.42	-0.421	2.209	0.827	.419
Academic Self (TSCS)(range12-60)	43.21	43.21	0.000	4.433	0.000	1.000	41.72	43.89	2.167	4.342	-2.117	.049*	44.00	42.89	-1.105	2.826	1.705	.105
Satisfaction with Self (TSCS)(range21-105)	77.520	79.42	1.632	4.553	1.999	.058	77.29	81.50	4.611	7.777	2.515	.022*	79.43	78.68	-0.526	3.717	0.617	.545
Satisfaction With Life Scale (SwL) (1-7)	4.688	4.783	0.150	0.633	-1.161	.258	4.123	4.971	0.703	.789	-3.197	.006**	4.648	4.418	-0.105	0.505	-0.530	.602
Perceived Mastery (SPEQ)(range=1-5)	3.817	3.399	-0.405	0.474	4.182	.000 ***	3.948	3.563	-0.389	0.281	5.879	.000 ***	3.504	3.459	-0.045	0.749	0.262	.796
Perceived Body (SPEQ)(range=1-5)	3.166	3.482	0.25	0.422	-2.904	.008 **	2.707	3.524	0.770	0.560	-5.821	.000 ***	3.136	3.143	-0.015	0.587	0.112	.912
Perceived Fitness (SPEQ)(range=1-5)	1.033	2.271	0.437	0.543	-3.947	.001 **	1.534	2.458	0.944	0.251	-15.97	.000 ***	1.881	2.202	0.263	0.864	-1.329	.201
Perceived Comfort (SPEQ)(range=1-5)	3.300	2.533	-0.767	0.872	4.307	.000 ***	3.781	3.967	0.123	0.792	-0.655	.521	3.389	2.947	-0.442	1.051	.083	.984

Note: Statistically significant change scores are indicated by *p*- value superscripts: * (*p*<0.5), ** (*p*<.01), *** (*p*<.001) KEY: TSCS Tennessee Self Concept Scale; SPEQ Self Perception in Exercise Questionnaire

Table 14

Overview of Physiological Outcomes: Mean pretest, posttest, and pre-post difference scores, SDs, and pre-post paired-samples *t*-test results by group

Physiological	Alone Walk						Group Walk						Wait-to-Walk control					
Measures	Pre (n=25)	Post (n=24)	Change	SD	*t* (23)	*p*	Pre (n=21)	Post (n=18)	Change	SD	*t* (17)	*p*	Pre (n=21)	Post (n=19)	Change	SD	*t* (18)	*p*
Resting HR	74.333	75.833	1.5	6.705	-1.096	0.284	77.889	77.111	-0.778	8.157	0.405	0.691	74.053	76.105	2.053	10.298	-0.869	0.396
Diastolic BP	85.208	84.000	-1.208	6.290	0.941	0.356	82.167	80.833	-1.333	9.248	0.612	0.549	80.474	81.474	1.000	8.233	-0.529	0.603
Systolic BP	137.250	135.917	-1.333	13.373	0.488	0.631	130.50	133.111	2.611	11.833	-0.936	0.362	130.737	132.053	1.316	10.929	-0.525	0.606
Body weight (Kg)	73.467	73.904	0.438	1.197	-1.791	0.087	77.277	77.518	0.242	1.147	-0.867	0.399	70.163	71.100	0.937	1.071	-3.811	0.001 **
BMI (kg/m^2)	28.088	28.258	0.171	0.471	-1.620	0.087	30.059	30.159	0.100	0.434	-0.949	0.399	27.145	27.479	0.334	0.392	-3.720	0.002 **
Body Fat (%)	38.083	38.208	0.125	1.924	-0.318	0.753	39.147	39.235	0.088	1.049	-0.347	0.733	36.014	36.453	0.355	1.215	-2.511	0.022 *
Hand Grip strength (Kg)	26.042	25.419	-0.623	2.581	1.182	0.249	24.333	24.381	0.047	2.708	-0.074	0.942	25.484	24.974	-0.511	1.405	1.562	0.136
Leg squats to chair (no. completed)	10.792	12.000	1.208	0.72	-1.679	0.107	10.889	13.111	2.222	0.597	-3.721	0.002 **	13.529	13.294	-0.235	0.235	1.000	0.332
Flexibility (cm) (toe-line=35cm)	35.063	34.854	-0.208	3.342	0.305	0.763	31.528	32.333	0.806	2.108	-1.621	0.123	29.605	30.579	0.974	1.637	-2.593	0.018*
Abdominal strength (stage 1-5)	1.583	1.667	0.083	0.408	-1.000	0.328	1.667	2.111	0.922	0.217	-2.046	0.057	1.632	1.526	-0.105	0.459	1.000	0.331
1Mile Walk time (min)	17.486	16.769	-0.718	1.495	2.352	0.028 *	17.309	15.965	-1.344	0.957	5.958	0.000***	17.856	17.487	-0.369	1.006	1.599	0.127
HR post 1Mile Walk (bpm)	119.458	116.583	-2.875	14.372	0.658	0.517	120.778	121.833	1.056	8.500	-0.192	0.850	117.368	118.316	0.947	7.546	-0.613	0.548
Treadmill speed at RPE of 13 (km/hr)	4.300	4.804	0.504	0.680	-3.63	0.001 **	3.944	4.772	0.828	0.871	-4.032	0.001 **	4.274	4.311	0.037	0.589	-0.272	0.789
HR at RPE of 13 on treadmill (bpm)	108.125	108.750	0.625	11.359	-0.27	0.79	111.78	111.5	-0.278	12.352	0.095	0.925	113.63	113.000	-0.632	9.245	0.298	0.769
VO_{2max} estimated (ml/kg/min)	20.468	23.395	2.927	5.248	-2.763	0.011 *	19.887	24.608	4.722	4.029	-4.971	0.000***	19.186	20.145	0.959	3.280	-1.272	0.220

Note: Statistically significant change scores are indicated by p- value superscripts: * (p<0.5), ** (p<.01), *** (p<.001)

All dependent variables reached statistical significance: dif1TOTsc $F(1,59) = 6.80$, $p = .012$, $\varepsilon^2 = .10$; dif1PHYsc $F(1,59) = 6.12$, $p = .016$, $\varepsilon^2 = .09$; dif1SOCsc $F(1,59) = 5.82$, $p = .019$, $\varepsilon^2 = .09$. Inspection of mean pre-post difference scores found Exercise (Ex.) consistently reported higher mean scores than No-exercise (No-ex.): total self-concept (Ex. M = 9.9±15.5 and No-ex. M = 0.11±9.0), physical self-concept (Ex. M = 2.9±5.4 and No-ex. M = -0.53±3.7), and social self-concept (Ex. M = 2.1 ±4.3, No-ex. M = -0.4±2.2). A two-way between groups MANOVA age (4 groups)*exercise status (2 groups) found no main effects of age or interaction effects of age* exercise status.

In summary, as shown in Table 15, results indicate exercise positively affected older women's self-concept. Older women who exercised three times a week at moderate intensity for 12 weeks experienced significant increases in total, physical, and social self-concept compared to a similar group of women who did not exercise. All self-concept scores remained unchanged for the women who did not exercise.

4.3.2.1.2 Effect of exercise setting on self-concept: Alone vs. Group vs. Wait. A one-way between-groups MANOVA was performed to investigate the effect of the exercise setting on self-concept. The three dependent variables were; pre-post difference scores in total self-concept (dif1TOTsc), physical self-concept (dif1PHYsc), and social self-concept (dif1SOCsc) scales from the TSCS. Independent variable was experimental condition (Alone Walk, Group Walk, Wait-to-Walk). A statistically significant difference was found between groups on combined dependent variables: $mF(6,112) = 3.34$, $p = .005$; $\lambda = .72$, $\varepsilon^2 = .15$. Total and social self-concept difference scores violated assumption of equality of variances. Therefore, a more conservative alpha level of .025 was used for these variables in subsequent analysis of group differences in dependent variables, two of which reached statistical significance: dif1TOTsc, $F(2,58) = 6.33$, $p = .003$, $\varepsilon^2 = .18$ and

dif1PHYsc, $F(2,58) = 9.11$, $p = .0001$, $\varepsilon^2 = .24$. With adjusted alpha level of .025, dif1SOCsc, $F(2,58) = 3.801$, $p = .028$, $\varepsilon^2 = .12$ failed to reach significance. Inspection of the mean pre-post difference scores shows Group Walk reported higher mean scores than Alone Walk on total self-concept (Group M = 15.4±16.9, Alone M = 5.8±13.2) and physical self-concept (M = 5.6±5.7, M = 0.8±4.3). Follow-up analyses of covariance were not performed; as reported earlier, no baseline differences existed. Subsequent analysis of variance, ANOVAs, with Bonferroni post hoc tests performed on dif1TOTsc, dif1PHYsc by experimental group found one significant difference ($p = .005$) for Group compared to Alone Walk on physical self-concept (M = 5.61±5.7, M = 0.8±4.3). However, significant differences were found between Group Walk and Wait-to-Walk for both total ($p = .003$) and physical self-concept ($p = .0001$) (Group M = 15.4±16.9, Wait M = -0.1±9.0) and (M = 5.6±5.7, M = -0.5±3.7) respectively. A follow-up one-way ANOVA found a significant difference between Group and Wait, but not Group and Alone, on dif1SOCsc ($p = .24$) (M = 3.0±4.63, M = -0.42±2.21). A two-way between groups MANOVA age* experimental group found no main effects of age or interaction effects of age*experimental group.

In summary, as shown in Figures 9, 9a, and Table 16, results indicate the exercise setting differentially affected older women's self-concept. Older women who exercised in a group setting experienced significant increases in total, physical and social self-concept, compared to a similar group of women who did not exercise. However, the older women who exercised alone did not experience significant increases in either their total, physical, or social self-concept compared to the no exercise condition. Comparing the two exercise settings the older women who exercised in a group recorded significant increases in physical but not total or social self-concept compared to the no exercise condition. The women waiting to exercise remained unchanged on all self-concept measures.

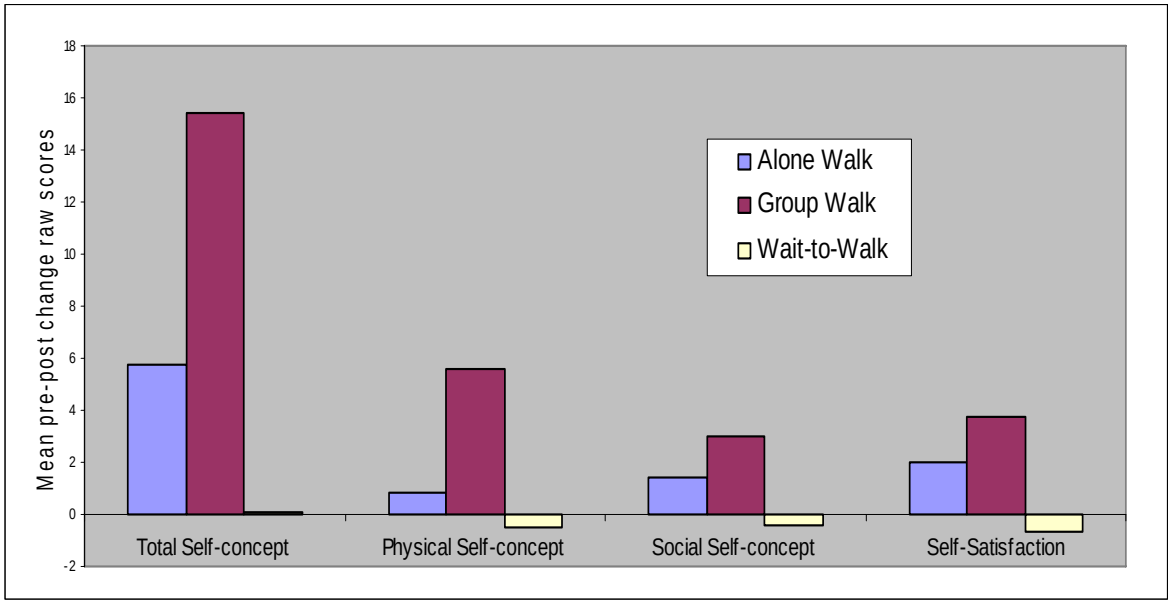

Figure 9. Group mean pre-post change raw scores for total, sub-scales (Physical, Social), and supplementary scale (Satisfaction) of self-concept on Tennessee Self Concept Scale as a function of experimental condition (Alone Walk, Group Walk, Wait-to-Walk)

Figure 9a. Figure 9 raw scores converted to T-scores, range 0-100 with a mean of 50

Note: Differences are significant for Group Walk compared to Wait-to-Walk on Total (p=.003), Physical (p=.0001), Social (p=.024) Self-concept and Self-satisfaction (p=.019).
Differences are significant for Group Walk compared to Alone Walk on Physical Self-concept (p=.005).

4.3.2.2 Self-Perceptions in Exercise

4.3.2.2.1 Effect of exercise on self-perceptions: Exercise vs. No-exercise. A one-way between-groups MANOVA was performed to investigate the effect of exercise on self-perceptions in exercise. Four dependent variables were used: pre-post difference scores in perceived exercise mastery (dif1MASTme), body perceptions (dif1BODYme), perceived fitness (dif1FITme), and a social aspect of exercise participation, perceived comfort or discomfort in the exercise situation (dif1SOCIme). Independent variable was exercise status: Exercise (A+G), No-exercise (W). There was a statistically significant difference between Exercise and No-exercise on the combined dependent variables: $mF(4,56) = 4.57$, $p = .003$; $\lambda = .75$, $\varepsilon^2 = .25$. One dependent variable, perceived mastery, violated assumption of equality of variances. Therefore, an alpha level of .025 was used for this variable in subsequent analyses. All but one dependent variable (dif1SOCIme) reached statistical significance: dif1MASTme, $F(1,59) = 5.78$, $p = .019$, $\varepsilon^2 = .09$; dif1BODYme, $F(1,59) = 9.97$, $p = .003$, $\varepsilon^2 = .15$; dif1FITme, $F(1,59) = 4.95$, $p = .030$, $\varepsilon^2 = .08$. Inspection of the mean pre-post change scores indicated Exercise reported higher scores than No-exercise on perceived body (Ex. M = 0.47±.55, No-ex. M = -0.02±.59) and fitness (M = 0.66±.51 and M = 0.27±.87). Exercise decreased more than No-exercise on perceived mastery (M = -0.39±.39 and M = -0.05±.75). A two-way between groups MANOVA age (4 groups)*exercise group (2 groups) found no main effects of age or interaction effects of age* exercise group.

In summary, as shown in Table 15, results indicate exercise had a significant and positive effect on older women's perceptions of their body and fitness, but a significant negative effect on their perceived exercise mastery, and no effect on their perceived social comfort or discomfort in the exercise situation when women who exercised three times a

week at moderate intensity for 12 weeks were compared to a similar group of women who did not exercise. Self-perceptions in exercise remained unchanged for the women who did not exercise.

4.3.2.2.2 Effect of exercise setting on self-perceptions: Alone vs. Group vs. Wait.

A *o*ne-way between-groups MANOVA was performed to investigate the effect of the exercise setting on self-perceptions in exercise. Four dependent variables were used: pre-post difference scores in perceived exercise mastery (dif1MASTme), body perceptions (dif1BODYme), perceived fitness (dif1FITme), and perceived social comfort/discomfort in exercise (dif1SOCIme). The independent variable was experimental condition (Alone, Group, Wait). A statistically significant difference was found between groups on the combined dependent variables: $mF(8,110) = 5.76$, $p = .0001$; $\lambda = .50$, $\varepsilon^2 = .29$. One dependent variable, dif1FITme, violated assumption of equality of variances. Therefore, an alpha level of .025 was used for this variable in subsequent analyses.

All but one dependent variable (dif1MASTme, $p = .066$) reached significance: dif1BODYme, $F(2,58) = 10.92$, $p = .0001$, $\varepsilon^2 = .27$, dif1FITme, $F(2,58) = 6.34$, $p = .003$, $\varepsilon^2 = .18$, dif1SOCIme, $F(2,58) = 4.93$, $p = .011$, $\varepsilon^2 = .15$. Inspection of mean scores found Group Walk consistently reported higher pre-post change scores than Alone Walk on perceived body (Group M = 0.77±.56 and Alone M = 0.25±.42), fitness (M = 0.94±.25 and M = 0.44±.54), and social comfort (M = 0.12±.79 and M = -0.77±.87). Follow-up analyses of covariance were not required. Bonferroni tests performed on dif1BODYme, dif1FITme, and dif1SOCIme found differences between Group and Alone Walk on perceived body ($p = .006$), fitness ($p = .028$), and social comfort/discomfort ($p = .008$) to be significant. In addition, Group Walk increased significantly compared to Wait-to-Walk on perceived body ($p = .0001$) and fitness ($p = .003$). Two-way MANOVA, age (4 groups)

by experimental group (3 groups), found no main effects of age or interaction effects of age by experimental group.

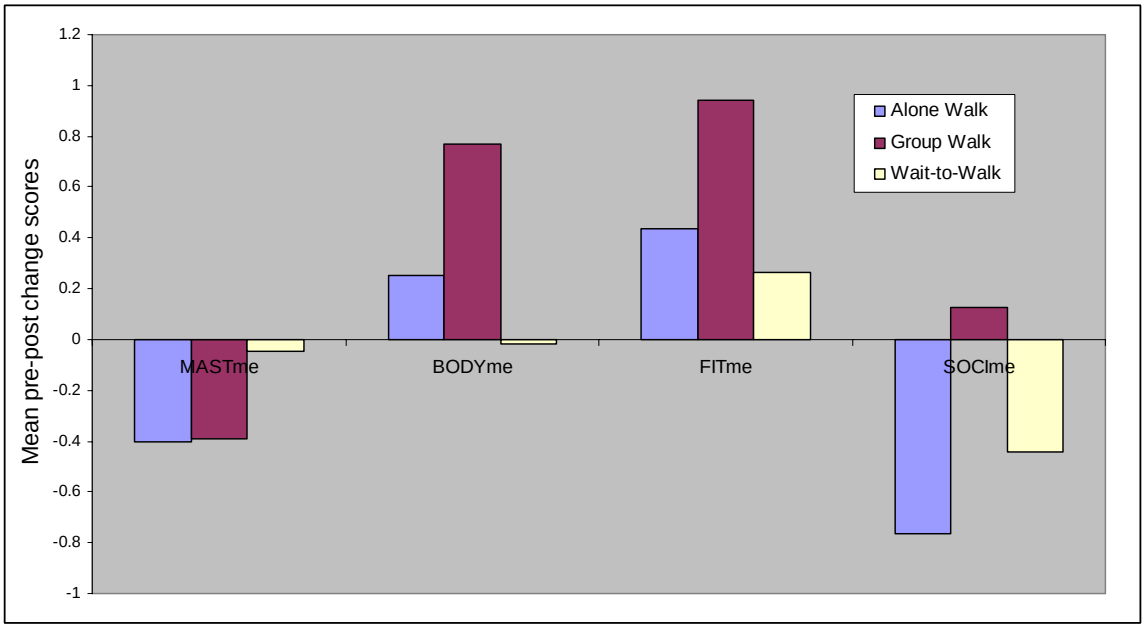

Figure10. Mean pre-post change scores for perceived exercise mastery, perceived body, perceived fitness, and perceived social comfort/discomfort in the exercise situation as a function of experimental condition: Alone Walk, Group Walk, and Wait-to-Walk

Note: Differences are significant for Group Walk compared to Wait-to-Walk on BODYme (p=.0001), FITme (p=.003), and for Group Walk compared to Alone Walk on BODYme (p=.006), FITme (p=.028), and SOCIme (p=.008).

In summary, as shown in Figure 10 and Table 16, results indicate the exercise setting differentially affected older women's physical self-perceptions in exercise. Older women who exercised in a group setting experienced significant increases in perceptions of their body and fitness, but not mastery or comfort, compared to a similar group of women who did not exercise. However, the women who exercised alone did not experience significant increases in their self-perceptions in exercise compared to the no exercise condition. Comparing the two exercise settings, women who exercised in a group experienced significant increases in perceptions of their body and fitness compared to those who exercised alone. Social comfort in exercise decreased significantly for the

women who exercised alone compared to those who exercised in a group, which infers they felt increasingly more comfortable exercising alone. All physical self-perceptions remained unchanged for the women who did not exercise.

4.3.2.3 Satisfaction with Life and Self

4.3.2.3.1 Effect of exercise on satisfaction: Exercise vs. No-exercise. A one-way between-groups MANOVA was performed to investigate exercise effects on satisfaction with self and with life. Two dependent variables were used, pre-post difference scores on the Satisfaction with Life scale (dif1SwL) and satisfaction supplementary scale on the Tennessee Self Concept Scale (dif1SATsc). The independent variable was exercise status: Exercise (A+G), No-exercise (W). First, two extremely outlying Satisfaction with Life scores were removed. A statistically significant difference was found between Exercise and No-exercise on combined dependent variables: $mF(2,58) = 6.188$, $p = .004$, $\lambda = .82$. When results for dependent variables were considered separately significant differences were found for dif1SATsc, $F(1,59) = 4.927$, $p = .030$, $\varepsilon^2 = .08$ and dif1SwL, $F(1,57) = 6.792$, $p = .012$, $\varepsilon^2 = .10$. Mean scores show Exercise reported higher pre-post change in satisfaction with self than No-exercise (Ex. M = 2.90±6.24 and No-ex. M = -0.53±3.7) and satisfaction with life (Ex. M = 0.39±0.75 and No-ex. M = -0.11±.51). No main or interaction effects of age (4 groups) by experimental group existed for either satisfaction measure was found on two-way MANOVA.

In summary, as shown in Table 15 results indicate exercise had a significant and positive effect on older women's satisfaction with self and with life in general when the women who exercised (either alone or group) were compared to a similar group of women who did not exercise. Satisfaction with self and with life in general remained unchanged for the women who did not exercise.

4.3.2.3.2 Effect of exercise setting on satisfaction: Alone vs. Group vs. Wait. A one-way between-groups MANOVA was performed to investigate the effect of the exercise setting on satisfaction with self and life. Two dependent variables were used, pre-post difference scores on the Satisfaction with Life scale (dif1SwL) and satisfaction scale (dif1SATsc) on the TSCS. The independent variable was experimental condition (Alone, Group, Wait). Two extreme outlying Satisfaction with Life scale scores were removed. There was a statistically significant difference between groups on the combined dependent variables: $mF(4,114) = 6.07$, $p = .0001$; $\lambda=.68$. No assumptions were found to be violated. Both satisfaction variables reached significance; dif1SATsc $F(2,58) = 4.066$, $p = .022$, $\varepsilon^2 = .12$, and dif1SwL $F(2,56) = 7.507$, $p = .001$, $\varepsilon^2 = .21$. Inspection of Table 13 mean scores found Group Walk recorded higher pre-post change scores than both Alone Walk and Wait-to-Walk on both satisfaction variables. Follow-up Bonferroni post hoc tests on dif1SATsc and dif1SwL by experimental condition found differences between Group and Alone to be significant for satisfaction with life ($p = .021$) and differences between Group and Wait were significant for both satisfaction with life ($p = .001$) and self-satisfaction ($p = .019$). A 2-way between groups MANOVA age (4 groups) *experimental group found no main effect or interaction effects on either satisfaction measure.

In summary, as shown in Table 16 results indicate exercise setting differentially and positively affected older women's satisfaction with self and with life in general. Older women who exercised in a group experienced significantly increased satisfaction with self and with life in general compared to a similar group of women who did not exercise. Women who exercised in a group also experienced significantly increased satisfaction with life compared to the women who exercised alone. The women who exercised alone did not experience significantly increased satisfaction with life or self compared to the no

exercise control group. Satisfaction with life and with self remained unchanged for the women who did not exercise.

4.3. 2.4 Physiological Measures

4.3.2.4.1 Effect of exercise on physiological measures: Exercise vs. No-exercise. Conceptually similar physiological measures were grouped to form 3 domains: Aerobic fitness (Aerobic), Strength fitness (Strength), and Body fitness (Body). Three one-way between-groups MANOVAs were performed to investigate the effect of exercise on physiologic outcomes associated with the three fitness domains. For the Aerobic domain two dependent variables were used: pre-post change in VO_{2max} (dif1VO_{2max}), treadmill walking speed at moderate intensity of RPE of 13 (dif1speed@RPE13). For the Strength domain three dependent variables were used: pre-post difference scores on hand grip (upper body strength), leg chair squat (lower body strength), and graded sit-up test (abdominal strength). For the Body domain six dependent variables were used: pre-post change in body weight, BMI, percent body fat, resting HR, systolic blood pressure, and diastolic blood pressure. In each case the independent variable was exercise status: Exercise (A+G), No-exercise (W). Significant differences did not exist between Exercise and No-exercise on the combined dependent variables in the Strength and Body domains. However, a statistically significant difference was found between Exercise, No-exercise on combined dependent variables for Aerobic domain: $mF(2,58) = 5.80$, $p = .005$, $\lambda = .83$.

When results for the two aerobic dependent variables were considered separately both were found to reach statistical significance: dif1VO_{2max} $F(1,59) = 5.17$, $p = .027$, $\varepsilon^2 = .08$; dif1speed@ RPE13, $F(1,59) = 9.18$, $p = .004$, $\varepsilon^2 = .14$. Inspection of mean pre-post change scores showed Exercise reported greater change than No-exercise in VO_{2max} (Ex. M = 3.7±4.8, No-Ex. M= 0.96±3.28) and treadmill walk speed at RPE of 13 (M= 0.64±.8,

M = 0.04±.6). A two-way between groups MANOVA age by exercise status found no main effects of age or interaction effects of age* exercise status for aerobic fitness.

In summary, as shown in Table 15, results indicate exercise had a positive effect on older women's aerobic fitness. Older women who exercised three times a week for 12 weeks at moderate intensity experienced significant improvement on two measures of aerobic fitness, but not on body or strength measures, compared to a similar group of women who did not exercise. Strength, body, and aerobic fitness remained unchanged for the women who did not exercise compared to those who did exercise, however, as shown in Table 14 independent-sample *t*-test found body weight, BMI, and percent body fat increased significantly from pre- to posttest for the women who did not exercise.

4.3.2.4.2 Effect of exercise setting on physiological measures: Alone vs. Group vs. Wait. Conceptually similar physiological measures were grouped to form three domains: Aerobic fitness (Aerobic), Strength fitness (Strength), and Body fitness (Body). One-way between-groups MANOVAs were performed to investigate the effect of experimental condition (Alone, Group, Wait) on physiological outcomes in these three domains. The dependent variables used in each domain were the same as above for Exercise versus No-exercise analyses. Statistically significant differences were not found between groups on combined dependent variables in the Body or Strength domains. However, a statistically significant difference was found between groups on the combined dependent variables for the Aerobic domain: $mF(4,114) = 3.55$, $p = .009$; $\lambda = .79$. When results for the two aerobic dependent variables were considered separately both were found to reach statistical significance: dif1$VO_{2max,}$ $F(2,58) = 3.454$, $p = .038$, $\varepsilon^2 = .11$, dif1speedRPE13, $F(2,58) = 5.72$, $p = .005$, $\varepsilon^2 = .17$. Inspection of the mean scores showed Group recorded higher pre-post change than Alone Walk in VO_{2max} (Group M = 4.7±4.0, Alone M = 2.9±5.2) and

Table 15

Summary of Significant Effects as a Function of Exercise Status: Exercise (Alone Walk and Group Walk) (A+G) and No-Exercise (Wait-to-Walk) (W)

	Change Scores Exercise (A + G) (n=42)		Change Scores No Exercise (W) (n=19)		MANOVAs Exercise vs. No-Exercise Significance		Effect of Exercise: Exercise versus No-Exercise Inferences drawn following analysis of variance tests with pre-post difference scores as dependent variable for Exercise (A+G) compared to No-exercise (W)
Measures	Pre-post Mean Change	*SE*	Pre-post Mean Change	*SE*	*F*	*p*	
Total self concept	9.88	2.39	0.105	2.07	6.801	.012*	Exercisers exercised experienced significantly improved TOTAL self concept compared to no exercise
Physical self concept	2.88	0.84	-0.53	0.86	6.116	.016*	Exercisers experienced significantly improved PHYSICAL self concept compared to no exercise control
Social self-concept	2.12	0.67	-0.42	0.51	5.824	.019*	Exercisers experienced significantly improved SOCIAL self concept compared to no exercise control
Satisfaction self (TSCS)	2.90	0.86	-0.53	0.85	4.933	.030*	Exercisers experienced significantly improved satisfaction with self compared to no exercise control
Satisfaction with life (SwL)	0.39	0.12	-0.11	0.19	6.792	.012*	Exercisers experienced significantly improved satisfaction with life compared to no exercise control
Perceived Mastery	-0.398	0.06	-0.045	0.11	5.776	.019*	Perceived mastery decreased significantly for women who exercised compared to no exercise control
Perceived Body	0.473	0.08	-0.015	0.14	9.97	.003**	Perception of body condition increased significantly for women who exercised compared to control
Perceived Fitness	0.655	0.08	0.263	0.19	4.947	.030*	Perceived fitness increased significantly for women who exercised compared to no exercise control
VO2max estimated	3.715	0.74	0.959	0.75	5.171	.027*	VO2max (estimated) increased significantly for women who exercised compared to no exercise control
Walk speed RPE13	0.643	0.12	0.037	0.14	9.177	.004**	Treadmill walk speed at RPE of 13 increased significantly for women who exercised compared to no-ex control

Note: Significant findings only are presented on analyses of pre-post difference scores exploring the effect of a 12-week moderate-intensity exercise treatment on psychological and physiological measures in women aged 55 to 74 years (N = 67). Table 15a (Appendix D1) presents *all* results, significant or non-significant.

Table 16

Summary of Significant Effects as a Function of Experimental Condition: Alone Walk (A), Group Walk (G), and Wait-to-Walk control (W)

	MANOVAs		ANOVAs			Effect of the Exercise Setting: Alone Walk (A) versus Group Walk (G) versus Wait-to-Walk (W)
Measures	Group effect		A vs. W	G vs. W	A vs. G	Inference drawn following multivariate and follow-up univariate analyses of pre-post difference scores as dep. variable for A vs. G vs. W
	F	*p*	*p*	*p*	*p*	
TOTAL self concept (TSCS)	6.325	.003**	nsd	.003**	nsd	Significant group effect for TOTAL self concept with Group Walk improving signif compared to Wait-to-Walk control
PHYSICAL self concept (TSCS)	9.114	.000***	nsd	.000***	.005**	Significant group effect for PHYSICAL self concept with Group Walk improving signif compared to Alone Walk and compared to Wait-to-Walk
SOCIAL self concept (TSCS)	3.801	.028	nsd	.024*	nsd	Significant group effect for SOCIAL self concept with Group Walk improving signif compared to Wait-to-Walk control
ACADEMIC self-concept TSCS)			nsd	.045*	nsd	Significant group effect for ACADEMIC/WORK self concept with Group Walk improving signif compared to Wait-to-Walk control
Satisfaction with Life (SwL)	7.507	.001**	nsd	.001**	.021*	Significant group effect for satisfaction with life, Group Walk improving signif compared to Alone Walk and compared to Wait-to-Walk
Satisfaction with Self (SATsc)	4.066	.022*	nsd	.019*	nsd	Significant group effect for satisfaction with self, Group Walk improving signif compared to Wait-to-Walk
Perceived Body (SPEQ)	10.923	.000***	nsd	.000***	.006**	Significant group effect for perceived body with Group Walk improving signif compared to Alone Walk and compared to Wait-to-Walk
Perceived Fitness (SPEQ)	6.335	.003**	nsd	.003**	.028*	Significant f group effect for perceived fitness with Group Walk improving signif compared to Alone Walk and compared to Wait-to-Walk
Perceived Social comfort (SPEQ)	4.932	.011*	nsd	nsd	.008**	Significant group effect for perceived social comfort/discomfort with Alone Walk decreasing signif compared to Group i.e., women who walked alone perceived less comfort in the group exercise situation which infers more comfortable walking alone
VO2max (estimated/1-mile walk)	3.454	.038*	nsd	.033*	nsd	Significant group effect for predicted VO2max with Group Walk increasing signif compared to Wait-to-Walk
Walk speed at RPE13 (treadmill)	5.722	.005**	nsd	.004**	nsd	Significant group effect for walking speed at RPE of 13 (moderate intensity) with Group Walk increasing signif compared Wait-to-Walk

Key: dep.= dependent, nsd = no significant difference, signif.= significant/ly

Note: Bonferroni post hoc tests used

Significant findings only are presented on analyses of pre-post difference scores exploring the effect of the exercise setting on psychological and physiological measures in women aged 55 to 74 years (N = 67) following a 12-week moderate-intensity exercise treatment. Table 16a (Appendix D2) presents *all* results, significant and non-significant.

walk speed at RPE 13 (M = 0.83±.87 and M = 0.50±.7). Group Walk was also higher than Wait-to-Walk on VO_{2max} (Group M = 4.7±4.0, Wait M = 0.96±3.3) and walk speed at RPE of 13 (M = 0.83±.87 and M = 0.04±.59). Follow-up ANOVAs with Bonferroni post hoc tests found differences between Group and Alone Walk to be non-significant. However, a significant difference was found between Group and Wait-to-Walk on dif1VO_{2max} and dif1speed@RPE13 (p = .033, .004). Two-way between groups MANOVA age (4 groups) by experimental condition (3 groups) found no main effects of age or interaction of age by experimental condition on any physiological domain.

In summary, as shown in Table 16 the exercise setting differentially and positively affected older women's aerobic fitness levels. Older women who exercised in a group experienced significantly greater increases in the two measures of aerobic fitness used in this study, but not in body or strength measures, compared to a similar group of women who did not exercise. The women who exercised alone did not experience increased body, strength, or aerobic fitness compared to the no exercise condition. No differences existed between Group and Alone on any measures. Change was non-significant for the women who did not exercise, although as mentioned above, body weight/fat change was found.

4.3.3 Exploring Possible Mechanisms Underpinning Self-concept Change

This section examines associations between global and sub-domains of self-concept, between self-concept and real and perceived fitness, and self-concept and real and perceived body condition, as well as change in physical self-perceptions over time.

4.3.3.1 Associations between global and physical sub-domains of self-concept. To explore associations between exercise-induced change in global self-concept and change in physical and exercise-specific sub-domains of self-concept a Pearson product-moment correlation was calculated on pre-post change scores for exercisers (A+G) (n=42) on self-

concept, physical self-concept, perceived mastery, perceived body, and perceived fitness. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity, and homoscedasticity existed. As shown in Table 17, a large positive correlation was found between pre-post change in total self-concept and physical self-concept (r =.72, p =.000, n = 42), and small positive correlations between change in self-concept and perceived body (r = .23), and self-concept and perceived fitness (r = .14). Results indicate physical self-concept accounted for 51% of the variance in exercise-induced change in total self-concept. Body perceptions and perceived fitness accounted for 5.4% and 2% of the variance in global self-concept, respectively.

4.3.3.2 Self-concept and real and perceived fitness and body. First, to explore associations between exercise-induced changes in total and physical self-concept and real and perceived fitness for the combined exercise groups (Alone + Group) (n = 42) Pearson product-moment correlations were performed on pre-post difference scores for total and physical self-concept, two measures of real fitness (estimated $V0_{2max}$ and treadmill walk speed at RPE of 13), and perceived fitness. Preliminary analyses were performed to ensure no violations of assumptions were made. As shown in Table 17, correlations between real fitness and total and physical self-concept were <.1 or very small; all were positive. There was a small positive association between total self-concept and perceived fitness (r = .14*)* and a small but stronger association between perceived fitness and physical self-concept (r = .28). Results indicate perceived fitness accounted for 2% and 8.1% of the variance in pre-post change in total and physical self-concept, respectively (real fitness accounted for, at the most 1% and 1.6%). In summary, following a 12-week exercise treatment, change in perceived fitness accounted for more, but not significantly more, of the variance than real fitness change in increases in older women's global and physical self-concept scores.

Table 17

Correlation Matrix: Pre-post Change in Self-concept and Real/Perceived Fitness/Body

	Total Self-concept	Physical Self-concept	Perceived Body	Perceived Fitness	Estimated VO_{2max}	Walk Speed at RPE of 13	Body Weight	BMI	%BF
Total Self-concept	1								
Physical Self-concept	.716**	1							
Perceived Body	.232	.483**	1						
Perceived Fitness	.141	.284	.303	1					
Estimated VO_{2max}	.109	.129	.155	-.068	1				
Walk speed at RPE 13	.010	.075	.275	.140	.241	1			
Body Weight	.098	.073	-.174	.113	.041	-.034	1		
BMI	.081	.074	-.171	.104	.018	-.056	.991**	1	
% Body Fat	.090	.136	-.236	.238	.251	.122	.233	.225	1

** correlation is significant at the 0.01 level (2-tailed)

To explore associations between exercise-induced change in global and physical self-concept and real and perceived changes in body condition Pearson product-moment correlations were performed on pre-post difference scores in global and physical self-concept, three measures of real body change (pre-post differences in body weight, BMI, and percent body fat), and perceived body (BODYme). Preliminary analyses were performed to ensure no violation of assumptions (normality, linearity, homoscedasticity). As shown in Table 17, correlations between real body measures and total and physical self-concept were <.1 with the exception of physical self-concept and percent body fat (r =.136). Small to medium positive associations were found between perceived body and total self-concept (r = .23) and physical self-concept (r = .48, n = 42, p = .001). Perceived body accounted for 5.4% and 23.3% respectively of the variance in pre-post change in total and physical self-concept scores respectively (real bodily change accounted for, at the most 1%, 1.8%, respectively). In summary, following 12-week exercise treatment, change in perceived body condition made a significant contribution to physical self-concept and accounted for more of the variance in global self-concept than real body change.

To further explore associations between exercise-induced change in self-concept and real and perceived body and fitness, two multiple regression analyses were performed on pre-post change scores of exercisers (Alone + Group) (n = 42). This was not ideal, but was chosen to allow a bare minimum of 10 participants per variable; results should be regarded with caution. First entering dif1TOTsc, dif1BODYme, dif1BMI, dif1%BF, and second dif1TOTsc, dif1FITme, dif1VO2, dif1WalkSpeed into the models. No violations were found on either tolerance or scatterplots. Standardised Beta coefficients are reported in parenthesis. Perceived body (0.42) made a significant (p = .012) unique contribution to predicting self-concept change; it accounted for more change than either BMI (0.16) or percent body fat (-0.04). Perceived fitness (0.16) accounted for more of the variance in self-concept change than real fitness change; VO_{2max} (0.13) and Walk Speed (-0.4). All correlations were as reported in Table 17, with the exception of total self-concept and BODYme (r = .38, n = 42, p=.008). In summary, change in body perceptions accounted for significantly more of the variance in global self-concept change following exercise than change in real body measures.

4.3.3.3 Satisfaction and Physical Self-perceptions

To explore associations between exercise-induced change in satisfaction with self and physical self-perceptions Pearson product-moment correlations were calculated for pre-post difference scores for SATsc, PHYsc, MASTme, BODYme, and FITme. There was a medium positive relationship between self-satisfaction and physical self-concept (r = .40, n = 42, p = .008), and small positive relationships between self-satisfaction and perceived exercise mastery (r = .18), perceived body (r = .27), perceived fitness (r = .16). In summary, results indicate that as older women's physical self-concept, perceived mastery, body, and fitness increased following exercise, so too did their self satisfaction.

4.3.3.4 Exploring Change in Physical Self-perceptions over Time

To explore the effect of the group setting on changes in perceived mastery, body, fitness and social comfort or discomfort in exercise over the 12-week treatment period a series of repeated measures ANOVAs were performed on the four self-perception in exercise scales, MASTme, BODYme, FITme, and SOCIme, at 3-weekly intervals (t_0, t_3, t_6, t_9, t_{12}) for the three experimental conditions (Alone Walk, Group Walk, Wait-Walk). No violations of sphericity were found (epsilon >.7 on Greenhouse-Geisser for all scales). Significant interaction effects were found for factor*group on BODYme, *(*F =3.33, p =.002, λ = .64) and FITme, (F = 2.52, p = .015, λ=.697). Inspection of the time plots, presented if Figures 11-14, revealed greatest change occurred over the first six weeks for Alone and Group Walk. Paired sample *t*-tests were performed on mean Alone and Group FITme and BODYme scores at baseline and Week 3 (t_0-t_3) and repeated for all 3-weekly intervals. Significant increases were only found for t_0-t_3. Mean group body perception scores increased significantly from C for both exercise settings; Alone (t = 2.54, p = .02) and Group (t = 2.77, p =.012). Perceived fitness scores increased significantly from t_0-t_3 for both exercise settings; Alone (t = 2.51, p = .021) and Group (t = 3.01, p =.007). Inspection of Figures 12 and 13 reveals a steady, almost linear increase in BODYme and FITme for Group Walk over treatment duration. However, the initial increase for Alone Walk did not continue, scores plateaued or dropped following the first 3 week period, t_0-t_3.

To further explore change at Week 3, one-way ANOVAs were performed on t_0-t_3 difference scores for perceived fitness (dif3FITme) and perceived body (dif3BODYme) by experimental condition: Alone Walk, Group Walk, and Wait-to-Walk. A significant group effect was found for dif3FITme, F = 3.99, p =.023, and dif3BODYme, F = 3.14, p =.050.

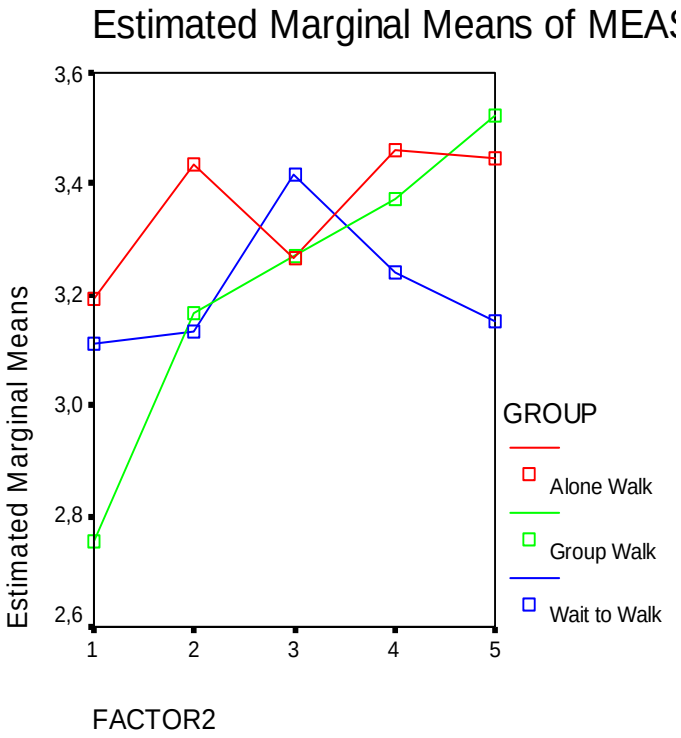

Figure 11. Mean perceived body scores (Factor 2) (BODYme) as a function of experimental condition over time, at 3-weekly intervals (1 = pretest, 5 = posttest)

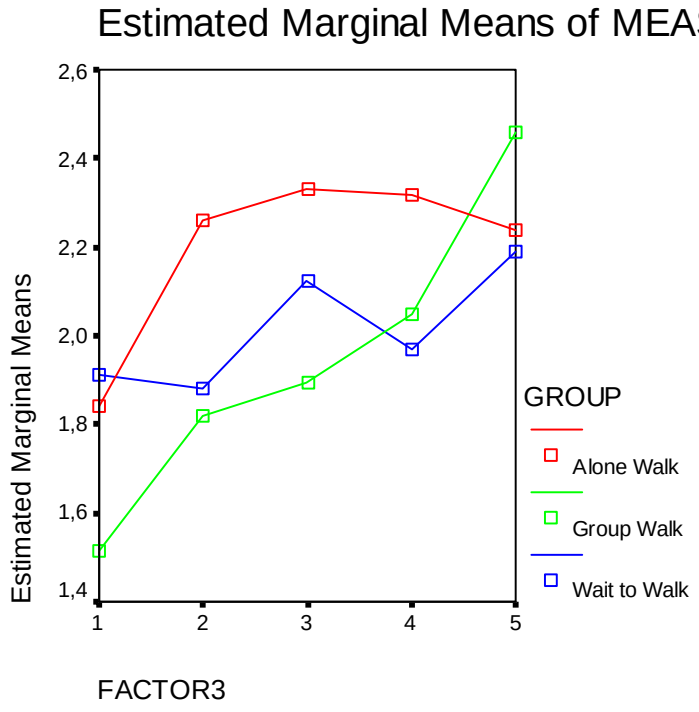

Figure 12. Mean perceived fitness scores (Factor 3) (FITme) as a function of experimental condition over time, at 3-weekly intervals (1 = pretest, 5 = posttest)

Bonferroni post hoc tests found significant change in perceived fitness from baseline to Week 3 (t_0-t_3) for Group Walk compared to Wait-to-Walk (p =.027) and for Alone Walk compared to Wait (p =.011). Change in perceived body at t_0-t_3 was significant for Group compared to Wait (p =.018) but not for Alone compared to Wait. In summary, results indicate change in perceived body and fitness was rapid. By Week 3, the women who exercised regularly either alone or in a group perceived their fitness significantly improved compared to the no-exercise condition. However, the women who exercised in a group, but not those who exercised alone, also perceived their body condition to be significantly improved by Week 3 compared to the no-exercise condition.

4.3.4 Adherence Issues

Two aspects of adherence were explored: adherence to prescribed frequency (total number of sessions completed), also referred to as participation rate, and adherence to prescribed exercise intensity (mean RPE rating) for the 12-week training period, to be referred to as totSES and mRPE respectively. Self-report data for sessions completed and exercise intensity were collected from participant log books.

Table 18

Adherence Rates for Older Women during the 12-Week Exercise Treatment

Group	Initial Sample	Final Sample	(drop-outs)	Pre-Post Adherence to the study	Mean Intensity from Log Books RPE/13	Mean Number of Sessions Completed/36	Adherence to Frequency (participation)	Intensity
Alone Walk	25	24	(1)	96.0%	12.96	34.47	95.8%	99.7%
Group Walk	21	18	(3)	85.7%	12.93	33.58	93.3%	99.5%
Wait-to-Walk	21	19	(2)	90.5%				
All	67	61	(6)	90.7%	12.94	34.01	94.6	99.6%

Note: A total of 36 sessions and intensity of RPE =13 (Borg 6-20 scale) were prescribed.
Wait-to-Walk data collected from log books following exercise treatment walking alone or in a group in the 12 weeks following posttest.

4.3.4.1 Monitoring Adherence to Prescribed Intensity

Each participant's mean 12-week RPE calculated from log book records (mRPE) was converted to a corresponding HR using the formula: (mRPE *10) -10. Thus an RPE of

13 corresponds to a heart rate of 120 bpm for an older person. This enabled HR recorded during intensity check to be compared to mean RPE from log books in order to determine adherence to prescribed intensity. Paired-sample *t*-tests were performed on the mRPE HR scores from log books and intensity check HRs recorded on Polar Advantage HR monitors for combined exercise groups and exercise groups, Alone and Group, individually. No significant differences were found. Mean HRs were 139 beats per minute (bpm) from log books and 143 bpm from intensity checks. As an additional monitor, paired-sample *t*-tests were performed on mRPE HR scores and treadmill HR recorded while walking at RPE of 13 at pretest. No significant differences were found. Mean HRs were139 bpm from log books and 137 bpm recorded on treadmill walk at RPE of 13. Results indicate participants adhered to the prescribed exercise intensity of RPE of 13 (Borg 6-20 scale).

4.3.4.2 Effect of the Exercise Setting on Adherence

One-way ANOVAs were performed for Group compared to Alone Walk on group mean scores for adherence to the study and frequency and intensity of exercise. Significant between-group differences were not found; group means are presented in Table 18. In summary, results indicate the exercise setting, walking either alone or in a group, did not differentially affect adherence to either frequency or intensity of the exercise performed.

To further explore the effect of the exercise setting on adherence to exercise frequency, the mean number of sessions completed for Alone and Group Walk for Weeks 1-3, 4-6, 7-9, and 10-12 were computed as percentage of sessions prescribed for each 3-weekly period (%totSES). A series of one-way ANOVAs found only one significant difference, Weeks 4-6, $F(1,37) = 12.14$, $p = .001$ (Alone M = 96.76±5.16 and Group M = 82.44±16.16) as shown in Figure15.

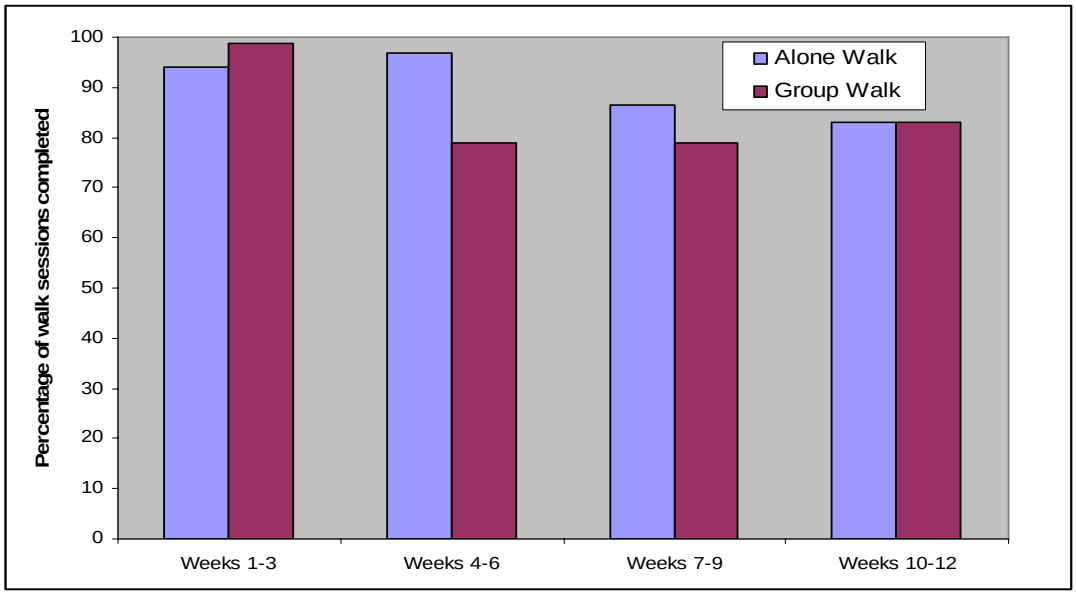

Figure 15. Older women's exercise adherence (percentage of sessions completed) over time as a function of exercise setting

Note: Differences are significant for Alone Walk compared to Group Walk at Weeks 4-6 only (p =.001).

4.3.4.3 Adherence and Baseline Demographics

To explore relationships between baseline demographics and adherence Pearson product-moment correlations were calculated for both aspects of adherence, frequency and intensity of exercise (totSES, mRPE respectively) and age, body size (BMI), educational level, and employment and marital status. No significant relationships were found between sessions completed and demographic variables, except for a moderate negative association between education and RPE adherence (r = -.38, n=28, p =.049). Results indicate as level of education increased, adherence to exercise intensity decreased. To further explore the effect of demographics on adherence, the (%totSES) scores were examined in four age groups: 55-59 years (n = 14), 60-64 years, (n =13), 65-69 years (n = 9), and 70-74 (n = 6) years. Small cell frequencies in the two oldest age groups mean results should be regarded with caution. A two-way between groups ANOVA performed on %totSES for age by

experimental group found no main or interaction effects. However, as shown in Figure 16, a trend existed for adherence to increase with age.

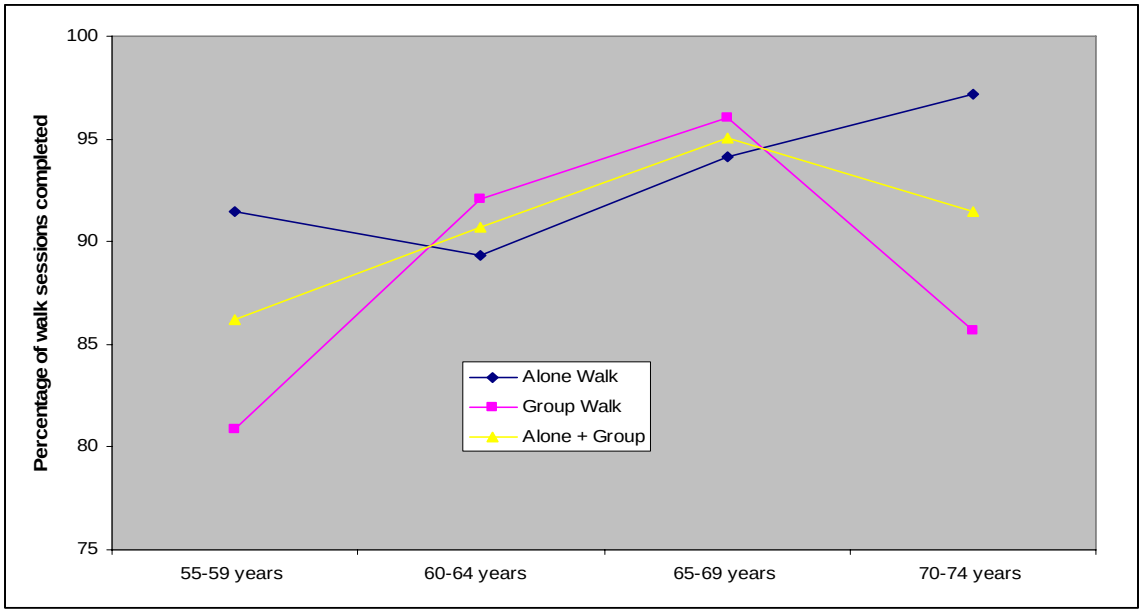

Figure 16. Older women's exercise adherence as a function of age and experimental group

Note: Between group differences are non-significant.

4.3.4.4 Adherence and Treatment Outcomes

To explore relationships between adherence and pre-post change in psychological and physiological measures Pearson product-moment correlations were calculated for both aspects of adherence (totSES, mRPE) and pre-post difference scores for all psychological and physiological measures. No significant relationships were found between adherence to either frequency or intensity of exercise and any psychological or physiological change scores. Results indicate adherence was not significantly related to any treatment outcomes.

4.3.4.5 Older Women's Initial Motives to Exercise and Adherence Motivators

Responses to the pretest Exercise Questionnaire item, "Could you list your reasons for taking part in the 12-week walking program" and to the adherence questionnaire rating adherence motivators administered in Week 3 were tabulated. In order of importance, the

initial motives to exercise were fitness, get motivated, and weight loss. Week 3 reasons for adherence to the walking program were fitness, health, enjoyment, feeling better about myself, and weight loss. Responses to a Pre-Exercise Questionnaire item, "Could you list your expectation(s) of the program" were, in order of importance, to get fit, to get into an exercise routine/habit, and lose weight. A small cohort of participants reported they wished to contribute to the research which motivated them to start and stay motivated to complete the program.

4.3.4.6 Environmental Influences on Older Women's Exercise Adherence

Responses to the adherence questionnaire, Perceived Environmental Influences on Exercise Adherence, administered in Week 9 were tabulated. Exercisers, that is, Alone and Group participants (n=42), were asked to rate on a 4-point Likert scale the influence of four factors, weather, safety, proximity, and aesthetics on adherence to (i.e., "sticking to") the walking sessions. As shown in Table 19 the most common response was "No influence at all". Strongest influence was aesthetics of the exercise setting, that is, how it looked and felt to the participant. Return-rate was 81%. Results indicate environmental factors did not exert a strong influence on older women's adherence to the 12-week exercise treatment of moderate intensity walking three times per week.

Table 19

Response Frequencies: Older Women's Ratings of Perceived Environmental Influence on their Exercise Adherence at Week 9 of the 12-Week Exercise Treatment (n = 35)

Factor	1= No influence	2 = Moderate influence	3 = Strong influence	4 = Very strong influence
Weather	20	9	5	1
Safety	21	8	3	3
Proximity	19	7	6	3
Aesthetics	14	7	9	5

4.3.5 Results Summarised

Significant findings for psychological and physiological outcomes were presented earlier in Summary Tables 15 and 16 (pp.146, 147) and all findings are summarised in Tables 15a and 16a, Appendices D1, D2 (pp. 236, 237). Effect sizes are presented below in Table 20.

Table 20

Effect Sizes as a Function of Group: Effect of the 12-Week Moderate Intensity Walking Treatment on Psychological and Physiological Measures in Women aged 55-74 years.

Measure	Alone Walk (A) Effect Size	Group Walk (G) Effect Size	Combined Exercise (A + G) Effect Size
Total self-concept	0.49	1.13	0.71
Physical self-concept	0.33	1.29	0.68
Social self-concept	0.52	0.95	0.67
Satisfaction with life	0.88	1.33	1.04
Satisfaction with self	0.58	0.85	0.64
Perceived mastery	0.59	0.60	0.67
Perceived body	0.53	1.38	0.87
Perceived fitness	0.25	1.06	0.61
Perceived social comfort	0.34	0.60	0.44
Body weight	0.41	0.59	0.51
BMI	0.34	0.51	0.44
%Body fat	0.13	0.23	0.17
Walk speed at RPE of 13	0.69	1.77	0.84
VO_{2max} estimated	0.44	1.03	0.63

4.3.5.1 Summary: Effect of Exercise

Following a 12-week exercise treatment older women who walked regularly at moderate intensity were found to have significantly improved total, physical, and social self-concept, more positive perceptions of their body and fitness, increased satisfaction with life and with self, and improved aerobic fitness compared to a similarly motivated group of non-exercising women who were waiting to start an exercise program. However, perceived exercise mastery decreased for those who exercised compared to those who did

not. As presented in Table 20, effect sizes for the effect of the 12-week moderate-intensity (RPE of 13) walk treatment on psychological and physiological outcomes ranged from small to large; the majority were in the medium range (0.4 to 0.69).

4.3.5.2 Summary: Effect of Exercise Setting

Following a 12-week exercise treatment older women who walked regularly in a group at moderate intensity experienced significantly improved total, physical, and social self-concept, satisfaction with self and with life, more positive perceptions of their body and fitness, and increased aerobic fitness levels compared to a similar group of women who did not exercise. However, women who performed exactly the same exercise alone did not improve significantly compared to no exercise control on any treatment outcome. Comparing the two exercise settings, Alone Walk and Group Walk, women who walked in a group, experienced significantly improved physical self-concept, satisfaction with life, and more positive perceptions of their body and fitness compared to the women who walked alone. However, social comfort in the exercise situation decreased for the women who walked alone compared to those who walked in a group indicating they felt more comfortable exercising alone. As shown in Table 20, effect sizes for the effect of exercise on psychological and aerobic fitness outcomes were consistently large for group walk, but mastery and comfort were medium. Effect sizes were low to moderate for alone walkers.

4.3.5.3 Summary: Adherence

Exercising either alone or in a group did not differentially affect adherence to the walking trial or prescribed frequency or intensity of walking. Neither psychological nor physiological outcomes were related to adherence. Although a trend was observed for exercise frequency to increase with age, demographic variables were not reliably related to adherence with one exception; as level of education increased, adherence to prescribed

exercise intensity decreased. The most important initial expectations of and reasons to exercise were fitness, motivation, and weight loss, and at Week 3, reasons were fitness, health, enjoyment, feeling better about oneself, and weight loss. For the older women involved in this study the strongest environmental factor influencing adherence at Week 9 was found to be the aesthetics of the exercise setting; neither the weather, safety, nor proximity were rated as a strong influence on adherence (i.e., “sticking to the program”).

4.3.5.4 Summary: Mechanisms Underpinning Exercise-induced Self-concept Change

Changes at physical sub-domain levels were found to be positively associated with change at the global level of self-concept. Perceptions of fitness and body accounted for more of the variance in exercise-induced change in self-concept than change in real fitness and body; but only perceived body was significant. As reported earlier the exercise setting differentially affected physical self-perceptions; the women who walked in a group, experienced significantly improved physical self-concept, and more positive perceptions of their body and fitness compared to women who walked alone. Self-perceptions changed rapidly for the women who exercised; perceived fitness (for both Alone and Group) and perceived body (for Group Walk only) had increased significantly by Week 3 of the 12-week exercise treatment. These perceptions continued to rise in an almost linear manner for the group exercisers but plateaued for the alone group (see Figures12 and 13, p.153).

4.4 Discussion

The present study comprises the main body of work for this thesis. It examined the effect of exercise and the exercise setting on older women’s self-concept. It may be the first to do so. At the same time it attempted to identify possible mechanisms underpinning exercise-induced change in self-concept, including the effect of the group and change in real and perceived body and fitness. Adherence correlates and the hierarchical structure of

self-concept were also examined and will be discussed in the following chapter. The study used a pre-posttest design. There were three groups: Alone Walk, Group Walk, and Wait-to-Walk. To examine the effect of exercise on self-concept, Alone Walk and Group Walk were combined to form a combined exercise group which was compared to the no exercise control group, Wait-to-Walk. To examine the effect of the exercise setting on self-concept, the two exercise groups were compared to each other and to the Wait-to-Walk group.

Although group differences were not found at baseline on any physiological, psychological, or demographic variables, women who exercised regularly either alone or in a group experienced significantly improved self-concept (*ES* = 0.71) following a 12-week exercise treatment of moderate-intensity walking (50 minute sessions thrice weekly) compared to a similar group of women who did not exercise, but were waiting to start an exercise program. This was as expected and in accord with the only two controlled studies found in the literature examining the effect of exercise on self-concept in non-clinical older adult male/female samples (Berryman-Miller, 1988; Perri & Templer, 1985); no female samples were found. Both studies used the total self-concept raw score on the Tennessee Self Concept Scale as the measure of self-concept, as did the present study, but neither reported sub-domain scores and, neither reported gender-specific outcomes.

Berryman-Miller (1988) reported significantly improved self-concept in a sample of retired adults aged 55-85 years following eight months of dance-movement training in a group setting compared to a no-exercise control (90 minute sessions twice weekly). No data were available to compute effect sizes. Perri and Templer (1985) found significantly improved self-concept (*ES* = 0.81) in a sample of older male/female volunteers (60-79 yrs) following a 14-week low-intensity walk/jog treatment compared to a no-exercise control (50 minute sessions thrice weekly). The participants exercised together under supervision.

It may be concluded from these two studies and the present study, that medium- to low-intensity aerobic exercise treatments of durations ranging from 12 to 39 weeks performed in a group setting have the potential to enhance the self-concept of older adults. However, the efficacy of low-intensity exercise to positively affect older *women*'s self-concept remains to be determined and home-based exercise effects are unclear. To this end, and also to confirm the present study's positive finding based on the present medium-intensity exercise prescription, a randomised controlled trial comparing groups of older women walking at different intensities, low and medium, in different settings, alone or in a group is suggested. It would also be interesting to examine the effect of own-pace walking.

Parallelling the present study's finding of improved global self-concept two other measures of subjective well-being, satisfaction with self (*ES* = 0.64) and satisfaction with life (*ES* = 1.04), also increased significantly for the older women who walked regularly for 12 weeks, either alone or in a group, compared to the women who did not walk regularly. Research in this area on older adults has mainly been focused on satisfaction with life rather than on satisfaction with self. However, two studies involving younger women found significantly improved satisfaction with self on the Tennessee Self Concept Scale. The first, following 6 weeks of strength training (Ben-Shlomo & Short, 1986), and the second, after 10 weeks of aerobics (Plummer & Koh, 1987). A small number of studies have examined self-satisfaction in older adults following exercise with positive results, but they have mainly focused on satisfaction with bodily specifics such as body shape and appearance (e.g., Brown et al., 1995) rather than with the self overall.

Consistent with present results, a number of studies have reported improved satisfaction with life following exercise/physical activity in older adults (e.g., McAuley et al., 2000; McMurdo & Burnett, 1992; Rejeski & Brawley, 1997; Rejeski & Mihalko,

2001) and in obese older females (Grant et al., 2004); positive results were reported in both group- and home-based treatments. Noted in these studies was the important moderating effect of self-perceptions, of social relations, frequency of exercise, and the physical activity environment in maximising improvements.

As well as focusing on satisfaction with life as a measure of quality of life in general, a larger body of research has focused on the more clinical and geriatric outcome of health-related quality of life (HRLQOL). Cross sectional studies indicate more active people are more likely to experience higher HRLQOL but such findings are not causal. In randomised controlled trials in older healthy adults, ten studies were located in a review of physical activity and HRQOL (Rejeski et al., 1996) eight of which reported positive outcomes. The weight of evidence presented above lends support to the present study's findings of older women's increased satisfaction with life and satisfaction with self after twelve weeks of moderate-intensity walking, however, more studies are needed involving older women to confirm the present study's results.

Two sub-domains of self-concept, physical self and social self on the TSCS, were also found to improve significantly for the women who exercised in the present study compared to the women who did not (*ES*s physical 0.68, social 0.67). In controlled studies using the TSCS in younger adult samples (see Table 2, p.19) two studies scored the social scale, both reporting significant improvements (Plummer & Koh, 1987; Stein & Motta, 1992). Six studies reported scores on the physical scale. All found significantly improved physical self-concept, including two with middle-aged adults (Brown & Harrison, 1986; Wilfrey & Kunce, 1986). In another related study McAuley et al. (1997) found significant improvements in physical self-worth in a middle-aged adult sample following 20 weeks of group exercise. This was not the case in the single controlled study located in the literature

using an older female sample, involving post-menopausal women (Shaw et al., 2000) in which physical self-concept and physical self-perceptions were measured using Fox and Corbin's (1989) Physical Self Perception Profile for adults (PSPP-A, Chase 1991). Minimal non-significant change in physical self-concept and one of its 4 sub-domains, perceived appearance, was reported for the women who performed lower-body weight training for nine months compared to a no-training control. The authors suggested the type of exercise stimulus might have mediated the magnitude of change. Alternatively high baseline self-esteem scores may have contributed to a ceiling effect. When the sample was divided and reanalysed according to low or high self-esteem, operationalised as above or below the sample's baseline mean, only perceived appearance, improved, and only for the low self-esteem group significantly (*ES* = 0.55). This suggests that results might have been different if Shaw et al.'s sample had been more representative of older women. It was a convenience sample. The study was part of a larger falls-prevention study which had attracted a special population of women according to the authors.

The results reported above lend partial support to the present study's finding of significantly enhanced physical self-concept for older women following 12 weeks of moderate-intensity walking. However, the significant and positive effect exercise had on older women's social self-concept, that is, their sense of self in relation to other people cannot be directly corroborated but speculations can be made. It seems reasonable to assume that feeling better about themselves physically, including appearance, may have had carry-over effects on the way they felt about themselves socially; feeling more at ease with other people. This view is supported by the salience of body perceptions to older women as found in both Study 1 and the present study. Similarly, King et al. (1993) reported older adults had improved confidence following 12 weeks of aerobic exercise. In

addition, the adoption of a socially desirable and healthful behaviour such as exercise might also have affected the way the women perceived themselves in relation to other people and society in general, thus enhancing their social self-concept.

The older women who exercised in the present study were also found to have significantly enhanced perceptions of their body and fitness (*ES*s body 0.87, fitness 0.61), however, their perceived exercise mastery decreased significantly (*ES* = 0.67) compared to the women who did not exercise. The latter finding might be explained by the type and the intensity of the exercise prescribed. According to participants' comments in their log books, maintaining the prescribed rate of perceived exertion of "somewhat hard" (i.e., 13 on the Borg 6-20 scale) for 30 minutes during the conditioning phase of each walk session was found to be quite demanding for the previously non-exercising women (mean age 63 years) even though the conditioning phase was progressive from 20-30 minutes over the first five weeks and all sessions included a 10-minute warm-up of slow walking. This might have led them to believe they were not very good at walking, an exercise modality at which they would have previously considered themselves to be reasonably proficient.

The women in the present study experienced, on average, a drop of 10% on mean baseline perceived exercise mastery scores. Comparison with extant studies is somewhat difficult because most have evaluated perceptions of either sport or physical activity competence/self-efficacy, whereas the present study had a more exercise-specific focus. In the only study located using the same instrument as the present study, exercise mastery was found to increase significantly for middle-aged adults following 12 months of aerobic exercise (Sorensen et al., 1997), but comparisons are questionable as the sample was 92% male. Men have been found to rate their physical ability and skills more highly than women. In an older adult study, King et al. (2000) measured perceived functioning and

well-being which included participant ratings of sense of mastery change following a 12-month treatment; these were not pre-post-scores. The study compared two physical activity programs: Fit & Firm and Stretch & Flex. The women in the Fit & Firm group which involved moderate-intensity aerobic and strength training dropped 4.5% on baseline sense of mastery yet scores did not decrease for the women on the Stretch & Flex group or for men in the Fit & Firm group. It appears older women might find moderate-intensity aerobic exercise harder than they expect when HR checks (e.g., in King et al.'s study) or ratings of perceived exertion (in the present study) are used to monitor prescribed exercise at moderate intensity over a 20-30-minute conditioning phase. This may lead them to believe they are not mastering the prescribed exercise.

The present study's findings of more positive body and fitness perceptions following an exercise treatment are supported by a number of studies involving older adults and one study with young adults (Chun-Ming, 2003). In a sample of adults aged 50 plus years Stoll and Alfermann (2002) found body self-concept improved significantly (*ES* = 0.67) after 14 weeks of moderate-intensity mixed group exercise. In three studies already mentioned: King et al. (1993) found significantly improved perceptions of fitness, shape, and appearance following 12 weeks of exercise of varying intensities and formats for adults aged 50-65 years; Berryman-Miller's (1988) dance-movement study of adults aged 55-85 years found significantly improved physical self-concept on the TSCS, which includes items about body shape and appearance; Sorensen et al.'s (1997) younger mainly male sample improved significantly on perceived body and fitness following 12 months of group aerobic exercise. Contrary to these findings, Shaw et al.'s (2000) weight training study of postmenopausal women, also discussed earlier, found perceived appearance improved only for participants low on baseline self-esteem.

Aerobic fitness was found to improve significantly for participants who exercised compared to those who did not in the present study providing partial support for the predicted physical benefits of brisk walking for older women. Multivariate analyses of fifteen physiological measures grouped into three domains, strength, body, and aerobic fitness, found aerobic fitness to improve significantly for older women who walked three times a week at moderate intensity for 12 weeks. The two aerobic measures were pre-post change in estimated VO_{2max} on the Rockport 1-Mile Walk and change in treadmill walking speed at an RPE of 13 (*ES*s 0.63, and 0.84 respectively). The exercise treatment failed to have a significant effect in the body and strength domains.

The failure to find significant effects in somatic variables may be due to 12 weeks being insufficient to affect diastolic and systolic blood pressure and resting HR (Green & Crouse, 1993), and also not long enough for significant weight loss in older retired women yet it has been found to be effective in older overweight women after 12 weeks (Grant et al., 2004) and in younger samples still in active employment (e.g., middle-aged adults, King et al., 1989), but this was after 1 year. However, consistent with the present study's findings King, Haskell, Young, and Oka (1991) reported non-significant changes in BMI for older women after 24 months of group- and home-based medium-intensity exercise and in a study reporting gender effects, Juneau et al. (1987) found significant weight loss for men but not for women after 6 months of moderate-intensity home-based exercise.

In the present study although body weight did not decrease significantly, weight maintenance, as reported for the women who exercised might be considered a positive outcome in this age group to whom weight gain of 1-2 kg per decade is normal. The women who did *not* exercise experienced a significant pre-post increase in their body weight. In addition, the women in the present study were asked to maintain their normal

dietary practices. Previous studies have found weight loss is more likely when exercise treatment is combined with dietary advice and/or restrictions (e.g., Sorensen, 1997). The findings presented above suggest exercise alone might not be enough for weight loss in older women. This has important clinical implications for exercise adherence in this age group. A quarter of the women in the present study reported at baseline an expectation of weight loss and it was a reason for joining the study for 27% of the sample. A number of previous studies have demonstrated women exercise for weight control (e.g., Tiggermann, 2000) and Study 1 also found it an important reason for older women to exercise (Fig. 5).

Several factors may explain failure to find significant effects in strength variables. The graded abdominal test may not have been sensitive enough to change between levels 1 and 2, for older women. Observations suggested many women made gains (i.e., able to lift their shoulders further off the ground than at pretest) but not sufficient to register as a one-level increase (see test procedure Appendix C2). The functional leg squat-to-chair test placed too much stress on the knees of the older women, many of whom had to stop the test or found it too painful to continue after the trial squats. It was chosen because it was a functional test compatible with the exercise prescribed but was too difficult for the older women. In hindsight, a leg-extension or chair rise test (e.g., Skelton & McLaughlin, 1996) might have been more appropriate. Leg and abdominal strength tests used may have failed to measure strength increases which may have existed. This was a procedural weakness which should be addressed in future studies. Few studies to date have measured change in leg and abdominal strength in response to a walking program. Most have measured VO_{2max} only, so this would have been valuable information with implications for falls prevention.

The 19% increase in estimated VO_{2max} for the women who walked regularly in the present study is consistent with age–adjusted predictions of 10-25% increase following

regular aerobic exercise in older adults (Marks, 2002), although increases of 50% have been reported according to McArdle (1996). Older men and women (>60 years) in Blumenthal et al.'s (1991) study increased their aerobic power by 10-15% following a 14-month aerobic exercise treatment. Green and Crouse's (1995) meta-analysis examining the effectiveness of exercise on aerobic power for adults aged 60^{+} years reported an effect size of 0.65; comparable to the present study, *ES* = 0.74. However these adult results may be inflated by higher male scores. Several studies have found smaller increases in older women and lower scores for women compared to men. In Brown et al.'s (1995) study older women improved 7% after 16 weeks of moderate intensity walking. In a middle-aged sample, Juneau et al. (1987) reported 15% for men and 9% for women after six months of moderate-intensity exercise. Improvements reported for older women in King et al.'s (1993) 1-year study comparing higher and lower moderate-intensity exercise ranged from 3-6% (men 4-6%). This low result may be explained by higher baseline measures in the latter study. Baseline scores were low in the present study, and this may explain the relatively large improvement in the present study compared to previous female samples of similar age and exercise intensity. Based on Australian normative female VO_{2max} data, the women who exercised in the present study increased on average from "Poor" to "Fair" in 12 weeks in response to three 50-minute sessions a week of moderate-intensity exercise. This is an impressive finding with public health implications.

Recapping thus far, as hypothesised, exercise positively and significantly affected the self-concept of older women following exercise performed either alone or in a group. As mentioned above self-concept increased significantly for the combined exercise group, at not only global but also at a number of sub-domain levels, compared to the no exercise group. However, it was expected that each group, Alone Walk and Group Walk would

each experience significantly improved self-concept and the Wait-to-Walk group would remain unchanged. Consequently, analyses were first performed on the combined exercise group compared to the no exercise condition to determine the effect of the exercise itself on self-concept. Then to explore the effect of the exercise setting and to determine whether or not the group was having an additive effect, analyses were performed comparing Alone Walk, Group Walk, and Wait-to-walk. Results of the between-group analyses found for the Alone Walk group, although their self-concept scores increased significantly pre- to post-treatment, did not make significant improvement on self-concept, or any other measure, compared to the Wait-to-Walk control group. This was a surprising finding. It suggests the combined exercise results were inflated by Group Walk results. Group Walk improved significantly compared to controls on not only global self-concept, but also on physical and social self-concept, satisfaction with life and with self, perceptions of their body and fitness, and aerobic fitness; their strength and body condition did not improve.

It was hypothesised that the exercise setting would differentially affect older women's self-concept and effects would be significantly greater when the exercise was performed in a group setting. Results support this hypothesis but not in the way expected. The group walkers improved significantly compared to the no exercise controls on self-concept, and other variables as reported above. The alone group did not. Although the women who exercised alone improved more than the controls, between-group differences were non-significant on all measures including self-concept. Adding more weight to the significant effect of the group, the women who walked in a group improved significantly compared to the women who walked alone on physical self-concept, satisfaction with life, and perceptions of their body and fitness. This finding supports the preliminary model presented in Chapter 2 which suggested improved self-concept might be differentially

affected by the group via greater change in physical self-perceptions when the exercise is performed in a group setting. This will be discussed further in Chapter 5. Support for the reported significant effects of the group setting is found in the preceding sections of this discussion on the effect of exercise on global and physical self-concept, satisfaction with life, and self-perceptions of body and fitness. The 19 supportive studies cited, and the one which was not (Shaw et al., 2000) all involved exercise performed in a group setting. As such they also support the superior effects experienced by the women who exercised in a group in the present study. Of the aforementioned 19 studies, four were similar to the present study in treatment duration and intensity (i.e., 12-16 weeks at moderate intensity) and age (i.e., middle-aged or older adults).

Brown and Harrison (1986) found significantly improved total and physical self-concept in a sample of young compared to older females after 12 weeks of group weight training; Brown et al. (1995) reported significantly improved body perceptions following a group walking treatment (40-50 years); Stoll and Alfermann (2002), in a 82% female sample (50^{+} years) reported significantly enhanced body perceptions in response to 14 weeks of moderate-intensity group exercise; Perri and Templer (1985) found significantly improved self-concept following a group walk/jog treatment in older adults (60-79 years).

One study, which involved Lockheed company workers prescribed home exercise (King et al., 1989), does not support the present findings for the alone group's unchanged perceived fitness. The middle-aged workers were found have more positive perceptions of their fitness following 6 months of home-based moderate-intensity exercise. However, these were younger men and women in full-time employment, and as such, dissimilar to the present study's sample. Considering the results of the present study and the four similar studies just mentioned it appears exercise might only affect self-concept and

physical self- perceptions positively when the exercise is performed in a group setting. Although the literature reviewed for this thesis concluded a positive exercise-self-concept association exists, this conclusion may not be entirely accurate. The findings presented above suggest, *group* exercise positively affects self-concept, might well be a more accurate statement. However, the effect of the group has received very little exercise research attention. In the exercise-self-concept literature review conducted for this thesis, no studies comparing the effect of different settings on self-concept could be located. However, one study compared the effect of different settings on physical self-perceptions (see Table 2, King et al., 1993). It compared groups of healthy older adults (N = 375) aged 50-65 years performing aerobic exercise at either lower or higher intensity at home, or higher intensity in a group. Both intensities actually fell within the ACSM (2000) guidelines for moderate intensity. No significant differences were found between the three groups following a 12-month treatment, however, all improved significantly compared to a control group on four of 15 scales on a rating of perceived change instrument devised for the study; *not* pre-post difference scores. The scales which improved were fitness, well-being, confidence, and shape and appearance. The higher intensity groups were prescribed three 40-minute sessions per week (120 min), the lower intensity five 30-minute sessions (150 min), and the effect of lower intensity was not examined in the group setting.

King et al.'s (1993) group versus home results do not support the present study's finding of significantly improved physical self-perceptions for the group walkers relative to alone walkers. This may be explained by a number of differences between the two studies. First gender differences; effects may differ for men and women. Second treatment duration; effects may differ at 12 months and 12 weeks. Third, home exercise received staff support in the King et al. trial as did the group exercise condition whereas in the

present study neither group was supervised. Fourth, measurement differences, participant ratings of perceived change at posttest may differ from pre-post change scores.

Looking further a field, a number of studies examining the effect of group versus home-based exercise on a range of variables have reported mixed findings. The majority have focused attention on fitness/health outcomes, mostly in clinical samples, few explored psychological outcomes. Supporting the present study's findings, Bravo et al. (1996) concluded, for older osteopenic women (50-70 years), a group-based program was much more effective for enhancing psychological well-being and perceived health than a home-based program. The exercise treatment involved walking and bench stepping performed three times a week for one hour over the course of one year. The group exercisers also improved significantly compared to the home exercisers on a number of fitness measures, namely, agility, coordination, strength, and endurance. However, a mind-body wellness intervention program delivered in either a group setting or at home via video presentations found the two settings to be equally beneficial for older adults with chronic illness in reducing pain, sleep difficulties, and anxiety and depression (Rybarczyk, DeMarco, DeLaCruz., & Lapidos, 1994).

Contrary to Bravo et al. (1996), however, exercise-physical outcome studies by King and colleagues (1991a, 1991b) (treatment 12 mo, 24 mo) which compared group to home exercise in healthy adults found both groups experienced significantly improved fitness compared to controls on treadmill test performance. Also, home-based strength programs have reported improved muscle strength relative to controls in both clinical and non-clinical samples (e.g., Jette et al., 1998; McMurdo & Burnett, 1992). Finally, studies examining the efficacy of supervised and unsupervised exercise training after coronary bypass surgery have found both formats result in similar functional improvements (e.g.,

Stevens & Hanson, 1984). Summing up, the potential for group exercise to confer psychological benefits, including enhanced self-concept and physical self-perceptions, is supported by a large number of studies examining these variables conducted in group settings, but results of a very limited number of direct comparison studies are equivocal and none examined exercise and self-concept in older women. However, both group and alone exercise appears to have the potential to confer similar fitness benefits.

An unexpected finding of the present study was the significantly improved aerobic fitness as measured by pre-post-change in estimated VO_{2max} for the women who walked in a group (*ES* = 1.03) compared to the control group yet this was not the case for the women who walked alone, although exercise did have a moderate effect on their estimated VO_{2max} (*ES* = 0.44). As mentioned previously, this was not as expected, and not consistent with the studies mentioned above in which fitness improved significantly for both home and group exercise. Results cannot be explained by field test error in the Rockport 1-Mile test which was used to estimate VO_{2max} because a second measure of aerobic fitness confirmed results. Pre-post-change in treadmill walking speed at a "somewhat hard" RPE of 13 also improved significantly for the women who walked in a group (*ES* = 1.8) compared to controls, and again, this was not the case for the alone walk group, although once again, the exercise treatment had a moderate effect on their walking speed (*ES* = 0.69). This apparent anomaly of non-significant differences between alone walkers and controls yet fairly robust effect sizes may be accounted for by group size affecting significance values.

Both the Alone and Group Walk groups were expected to experience similar physical change, in body composition, strength, and aerobic fitness because both groups followed the same exercise prescription for exercise intensity, exercise frequency, and session and treatment duration. According to exercise logs completed by participants and

intensity checks performed using Polar Advantage HR monitors, both groups adhered to the prescription of moderate exercise intensity, and frequency and duration of sessions. Additional analyses of the adherence data with regard to over- and under-estimating rating of perceived exertion (RPE), and accuracy of perceptions of RPE, were performed but no differences could be found between the groups to explain this finding. However, several suggestions can be offered.

Although frequency of sessions was self-reported by both groups, the women who exercised in a group may have been less likely to record a session as completed when it was missed because other group members would be aware of their absence from the group. Also, the group walkers would be more likely to walk for the prescribed duration of each session as they were accountable to each other. The alone walkers may have cut short some sessions. Supporting this view is anecdotal evidence provided by participants on the post exercise questionnaire. A large number of alone walkers commented that the sessions were too long and/or boring after the initial enthusiasm wore off, and they consequently had trouble staying motivated. Not a single group walker made such a comment. Also when asked on the same questionnaire if they had trouble sticking to the program, 55% alone walkers responded, “Yes”, but 100% group walkers responded, “No”. Yet, between-group differences were not found at Week 3 in response to the item “Are you having trouble adhering to the program?” on an adherence questionnaire. This latter rsult is not unusual. Most new exercisers are highly motivated in the early stages of training.

Another suggestion is the group walkers may have under-estimated their intensity. This is likely to occur when one is distracted from effortful exercise by the presence of others and/or while carrying on a conversation. However this view is not supported by Polar HR intensity checks. Alternatively social facilitation may have influenced exercise

motivation in the group setting. Social facilitation predicts the presence of others doing the same thing at the same time, but independently, could have influenced performance in group walkers (Martens, 1975), which in turn affected fitness outcomes as well as physical self-perceptions. The effect is stronger when the individual perceives the others in the group to be evaluating them (Zajonc, 1965) which may or may not be relevant in the context of older women. Most studies in this area involve younger samples.

It can only be concluded the group walkers adhered to duration of sessions and medium-intensity exercise prescription but alone walkers did not and this was not reflected in the Exercise Logs self-reported by the participants or on the intensity checks which were conducted only once per participant during treatment. More sophisticated steady-state HR and activity monitoring over several days at a time may have provided more reliable monitoring. The walk alone women could have easily maintained the prescribed moderate intensity and duration of the walking session on the once only monitoring in the present study, but walked at a slower pace and/or cut short their sessions at home alone. Although not as intended, however, these findings suggest that the group setting is more motivating for maintaining moderate exercise intensity, and frequency and duration of sessions for older women. Thus it offers greater aerobic fitness benefits to this population sub-group. This is a valuable finding with clinical implications.

Although the main purpose of the present study was to extend and add to current knowledge with regard to the effect of exercise and the exercise setting on self-concept, both of which have been discussed above, the study had a secondary purpose. It aimed to explore possible mechanisms underpinning the positive exercise-self-concept association including the exercise setting (group and alone) and exercise-induced changes in fitness (real and perceived) and body (real and perceived). Thus far it has been established that

exercise had a positive and significant effect on older women's self-concept and that the exercise setting differentially affected self-concept outcomes with effects significantly greater for the group setting. However, it must be noted that comparing studies in the exercise-self-concept field is extremely difficult with such a wide range of samples (clinical, non-clinical), treatments (of varying frequency, intensity, duration), participants (of different ages, gender), measures (of varying validity and reliability), and varying degrees of scientific rigour in methods, study design, sample size, and analyses used.

As predicted the group does appear to be a mechanism underpinning self-concept change; self-concept improved significantly when the exercise was performed in a group and non-significantly when performed alone compared to the wait-list control condition. It might be argued at this point that the improved fitness of the group walkers was responsible for this effect, and this could be the case if it were not for the significantly greater improvement in physical self-perceptions, including physical self-concept and perceived body and fitness, experienced by the group walkers compared to the alone walkers which suggests the difference was perceptual rather than being based on objective measures of fitness and bodily change. Supporting this view, correlational and regression analyses indicate perceived change accounted for more of the variance in self-concept following exercise than real change in both body condition and fitness.

Perceived body contributed the largest measure of change in both global and physical self-concept. Perceived body made a significant unique contribution to predicting physical self-concept change. There is little previous research to support these findings. Although a number of studies have measured fitness and self-concept outcomes, none has made comparisons between real and perceived change. Studies using aerobic treatments have measured aerobic fitness, or no fitness, and have rarely measure strength. Studies

employing a weights/strength treatment have measured strength outcomes when fitness was measured but not aerobic fitness. Few, if any trials in the exercise-self-concept field have attempted to measure as wide a range of variables as the present study. However, as mentioned earlier change in abdominal and leg strength may have gone undetected in the present study. Increased strength, if it existed, may have contributed to positive fitness and/or body perceptions. The women may also have experienced improved balance and posture, two aspects of fitness which were not measured in the present study, which might also have contributed to improved body perceptions. It would be appropriate to measure these two variables in future studies involving older women in this area of research.

A number of authors take the view improved fitness is responsible for improved self-concept following exercise (e.g., Shaw et al, 2000; Stewart et al., 1993) because, as already pointed out, when people observe measurable change in their aerobic and/or strength fitness they feel better about themselves physically. It is likely that these physical self-perceptions affect physical self-concept positively and global self-concept is similarly affected in turn. This does not appear to be the case in the present study. Results indicate pre-post change in VO_{2max} was not related to perceived fitness change (r = .07). Physical self-perceptions were apparently not based on measurable physical change in the present study, but on perceived change. This may be because people expect to change when they exercise or because of some other aspect of exercise participation (King et al., 1993; McAuley et al., 2000). These are questions the present study attempted to address.

Results indicate perceived change accounted for more of the change in self-concept than real change as pointed out above. Also, physical self-perceptions were measured every three weeks across the treatment period. Perceived body and fitness were found to increase significantly from baseline to Week 3 for both alone and group walkers (Figures

11,12), and continued to rise in a linear fashion to posttset for Group Walk but plateaued for Alone Walk. Similarly, King et al. (1989), found perceptions of fitness increased rapidly when they tested bi-weekly. It is unlikely real fitness or body condition would have improved within the first 2-3 weeks of treatment. Support for this view is found in the results of an interesting study in which self-concept outcomes were analysed only for participants who did not improve their fitness (DiLorenzo et al., 1999, Table 2). Their total self-concept on the TSCS increased significantly following a 12-week cycling treatment, indicating improved fitness is not necessary for improved self-concept following exercise. A number of authors support this view. They contend real fitness change is not necessary for self-concept change (e.g., Glenister, 1996; Jasnoski et al., 1981; King et al., 1993; Rejeski et al., 1996) but rather, some aspect of exercise participation is having an effect.

The present study proposed the exercise setting, exercising in a group, and the influence the group might have on physical self-perceptions would be found to be one possible mechanism positively affecting self-concept when individuals exercise together. And indeed, this did occur, physical self-perceptions increased significantly for the women who walked regularly in a group setting compared to controls and to those who walked alone. Effect sizes also confirm the differential and psychobeneficial effect of walking in a group for older women. For physical self-concept, perceived body, and perceived fitness effect sizes were 1.29, 1.38, and 1.06 for Group, and 0.33, 0.53, and 0.25 respectively for Alone Walk. These results pose a number of questions. Why did the women who walked with similar others experience significantly enhanced physical self-perceptions, and satisfaction with life in general, compared to the women who walked alone, and greater psychological benefits including enhanced self-concept relative to controls, whereas the alone walkers did not? What aspects of the group setting differentially affected these

variables? The literature provides no answers to these questions, but speculations can be made. One suggestion is that performing exercise with other similarly motivated peers providing positive feedback might have been more conducive to forming positive exercise identities and hoped-for future selves. Such shifts in self-referent thoughts would be expected to positively affect physical self-concept.

The group setting might have provided social support and fostered group cohesion (Estabrooks & Carron, 1999a). It was observed at posttest that a large number of the group walkers had made firm friendships and organised their schedules to attend the posttest together. This suggests a sense of group cohesion existed. Although both group and alone walkers shared the group goal of completing the study and attending the posttest, the women who met and walked together had an additional social goal. In order to attend walking sessions three times a week, early in the morning, they had to put themselves out for the group. As group cohesion developed the women may have found the exercise experience more enjoyable. Exercising for the pleasure of it and not for external rewards would have increase intrinsic motivation (see Deci & Ryan, 1985). They may have also experienced a sense of human connectedness fulfilling a basic human need for belonging and acknowledgement. This seems likely considering the study population. The majority of the women were retired and many lived alone. However, the effects of social support and group cohesion on self-concept are not known; most research in this area has focused on adherence outcomes (e.g., Fraser & Spink, 2001). Further studies are needed.

Another suggestion is that the group setting might have provided opportunities for non-tangible social reinforcement that is, verbal and non-verbal communications from one woman to another that increased the strength of the response to the walking program (Martens, 1975). Smiles and friendly gestures are forms of social reinforcement which

might have positively affected social and global self-concept as well as satisfaction with life in general. Positive reinforcement can also occur through knowledge of results which would have a positive effect on physical self-perceptions. Both alone and group walkers were keeping log books, however, the group might have provided additional reinforcement as the women talked amongst themselves about how well they were doing, congratulating each other on sticking to the program, and not missing sessions even when the early morning sessions were cold and dark.

A sense of social commitment and group cohesion together with the social support and opportunity to compare progress and fitness levels with peers might be some reasons the group walkers felt better about themselves and life in general, and about their bodies and fitness in particular. Reinforcing this view is the significant increase in social self-concept (*ES* = 0.95) reported for group walkers as well as the type of exercise prescribed. Walking was the most popular exercise modality for the older women surveyed in Study 1, and "going for a walk" is often viewed as a social activity in this population. It offers greater opportunities for proximity and social interaction than other exercise modalities which are often performed in a group setting such as strength training and aerobics. Before leaving this topic one final aspect of exercise participation needs to be discussed.

Expectations have been suggested to positively affect physical self-perceptions during and following exercise treatments and bias results. These are the expectations of change which people bring to the exercise situation (Berger, 1988; Brown et al., 1995; King et al., 1993; Morgan, 1997). The present study controlled for such expectations. All participants were volunteers who were similarly motivated to start an exercise program. Following randomisation some started and some waited to start. Thus all experimental groups were similarly motivated to exercise. It seems reasonable to assume that all groups

had similar expectations of physical and psychological benefits of the exercise program. This method was a strength of the present study considering many studies in this area have employed convenience controls having no desire to exercise and thus no way of controlling for placebo-like expectancy effects confounding results.

Two final and unexpected outcomes of the present study require comment. First comfort in the exercise situation decreased significantly for the women who exercised alone compared to the women who exercised in a group setting. Second, academic/work self-concept increased significantly for the group walkers, who met and walked together on the university campus. Cognitive dissonance might explain the alone walkers' feelings of decreased comfort in the group situation. Cognitive dissonance theory (Festinger, 1957) postulates that individuals have a desire to be consistent with themselves, and that the presence of inconsistency (dissonance) is psychologically uncomfortable, which motivates the person to try to reduce the dissonance and achieve consonance. When one finds an activity such as exercise hard and adherence is a struggle, then one's thoughts are brought into line with the expended effort and the uncomfortable feelings experienced. The person then removes the dissonance by claiming they like the alone exercise situation.

Finally, the finding of increased self-concept in the academic/work sub-domain on the TSCS is an unusual result following an exercise treatment and highlights the need to explore all sub-domains, which may be affecting self-concept, not just physical sub-domain in exercise trials. Unexpected influences may be underpinning self-concept change, and these would go undetected if physical self-perceptions alone were measured as some authors advocate (e.g., Marsh & Sonstroem, 1995). It seems reasonable to assume that attending the university three times a week for 12 weeks had an associative learning effect on the women who walked in the university grounds. This is similar to the effect of

a fitness centre on people's perceived fitness. Associative learning predicts they feel fitter because of the "get fit" connotations attached to the facility.

In conclusion, the present study has extended current knowledge of exercise effects on self-concept to older women and added to our understanding of possible mechanisms underpinning such change. As expected and consistent with previous findings in younger samples, exercise was found to positively affect older women's self-concept. The group exercise setting differentially and positively affected self-concept outcomes in the context of older women walking in a group at moderate intensity compared to a similar group of women performing exactly the same exercise alone. The effect of the group appears to be related to significantly greater change in physical self-perceptions when older women exercise in a group setting. Unexpectedly, significant increases in aerobic fitness were reported for group walkers but not for alone walkers, relative to controls. Considering the general lack of randomised controlled pre-post-test studies evaluating physiological and psychological outcomes in older adults, the present study contributes useful information with regard the potential utility of brisk walking as an exercise modality for psychological and fitness benefits in older women but not as a stand-alone weight loss aid in this population sub-group. However, psychological and fitness benefits appear to be greater for older women when the exercise is performed in a group setting with similar others, and maintaining moderate intensity. One question remains, however, can similar results be achieved for older women with low-intensity walking?

Suggestions for future research are as follows:

- Investigate the effect of social support, perceived physical competence, group cohesion, enjoyment, on older women's self-concept, physical self-perceptions, and satisfaction with life in different exercise settings: use existing scales (e.g.,

Brownson et al., 2004; Estabrooks & Carron, 2000; Kendzierski & DeCarlo, 1991; Richards, 1987) or develop sample-specific scales and/or structured interviews

Limitations of the present study were as follows:

- Once only exercise intensity monitoring
- Lower body strength testing procedure not appropriate

Suggested areas to be addressed if replicating the present study are as follows:

- Replicate the present study using low-intensity and/or self-paced (own pace) walking with older women in different exercise settings
- More rigorous monitoring of exercise intensity and duration of sessions
- Posture and/or balance test could prove useful as a real body change measure and add to findings re falls-prevention benefit if they were found to improve
- Measure waist-hip ratio which might show change even though body weight and percent body fat might not change in older women as a group

In conclusion, strengths of the present study are as follows:

- Used rigorous experimental design
- Used similarly motivated control group: thus controlled for positive expectations
- Used randomised controlled volunteers: not convenience sample
- Used detailed exercise prescription
- Use of postcard calendar to collect data on drop-outs
- Statistical analysis and effect size calculations were rigorous
- Adherence was high: results not biased positively by missing data from drop-outs
- Good results achieved with unsupervised exercise: thus cost effective
- Most previous results have been obtained with staff supervision of both home and group exercise, which may have biased results positively: experimenter demand

- Older women studied very little to date in this area
- It was theory based and hypotheses driven

CHAPTER 5: GENERAL DISCUSSION

IMPORTANT FINDINGS, IMPLICATIONS, AND FUTURE DIRECTIONS

What has this thesis added to the field of exercise-self-concept research and our understanding of the psychological benefits of exercise in the context of older women? To date, studies examining the effect of exercise on self-concept have not been independently reviewed. On the other hand, a considerable number of reviews have examined the effect of exercise on self-esteem. This may be because self-concept and self-esteem are often used synonymously or interchangeably in the literature (Hattie, 1992; Sorensen et al., 1999). Authors may have chosen to use the term "self-esteem" because its meaning is more universally understood and used more frequently in the popular press and everyday parlance. By comparison, the term "self-concept" appears to lack a clear concise and universally accepted definition (Byrne, 1996; Wylie, 1979). But self-esteem and self-concept are not synonymous. Terminology is a major concern in this area of research.

In general researchers agree that, conceptually, self-concept and self-esteem represent different aspects of the self-system (e.g. Hattie, 1992; Sonstroem & Potts, 1998). Some have likened this distinction to the difference between self-description and self-evaluation (Brinthaupt & Erwin, 1992; Byrne, 1996), or between cognitive (related to one's self-image) and affective (related to self-worth) (Huitt, 2004). It is important to focus on self-concept, which is one's own view of oneself, upon which one's self-esteem is based. Self-esteem is considered an evaluative aspect of the broader self-concept (Rosenberg, 1979). Self-concept, a behavioral moderator, which has been shown to change over time (Harter, 1999), is at the heart of the matter when dealing with behavioral

interventions such as exercise training. Substantive research indicates self-concept is perhaps the basis of all motivated human behaviour (Franken, 1994). People with a clear view of who they are, know what they can, and cannot do. This aspect of self-concept provides individuals with an invaluable reference point (Rosenberg, 1992): a “bed-rock”.

However, as mentioned earlier, in the literature, including a considerable number of exercise and self-esteem reviews and meta-analyses, the distinction between the terms self-esteem and self-concept is often ambiguous. Although an article may state self-esteem is being examined, authors frequently use the terms self-esteem and self-concept interchangeably, and at random, making it unclear to the reader whether self-esteem or self-concept is being discussed. Clearly, a need exists to identify and review studies focusing specifically, and unambiguously, on exercise and self-concept. In addition, in response to many researchers suggesting attention should be directed toward exercise effects on physical self-concept rather than global self-concept the effect of exercise on physical self-perceptions also requires review attention. Furthermore, a more detailed examination of moderating variables that may be associated with self-concept change is necessary to understand mechanisms and processes underpinning positive self-concept change, which are currently poorly understood. Thus a systematic review of controlled peer-reviewed studies examining exercise effects on self-concept and physical self-perceptions was undertaken as part of the research for this thesis. To ensure generalisabilty of results, and to avoid bias, only studies involving non-clinical samples were reviewed.

Results of the 33 controlled studies located in the literature from 1970-2004 and reviewed for this thesis support the reported positive effect of exercise on self-concept. Evidence was stronger for adults rather than children, and for physical self-perceptions rather than global self-concept. A positive association was found between chronic exercise

and self-concept, and an even stronger link between chronic exercise and physical self-perceptions. The overall effect size for exercise training on self-concept and physical self-perceptions was 0.46 for aerobic exercise and 0.29 for non-aerobic exercise (for adults). However, aerobic studies, mainly walking/jogging predominated in the studies reviewed. Effect size for the effect of exercise on self-concept was 0.36, and on physical self-perceptions was 0.41, in adult studies. Effect sizes were calculated using pooled standard deviations. Age was identified as a mediating factor, effects were greater for adults, but type, intensity, frequency of exercise, and gender were not. Duration of treatment was found to moderate outcomes; based on mean effect size for longer treatments (>12 weeks) compared to shorter, and improved fitness was tentatively suggested as a moderator. A major strength of the present review was its focus on controlled experimental trials using non-clinical samples increasing the strength and generalisability of its findings.

The majority of studies reviewed (91%) involved exercise performed in a group setting. This suggested the group might be having an effect on self-concept. However, only one previous study had examined the effect of different exercise settings on specific physical self-perceptions and none compared exercise effects on global self-concept. It was therefore decided to explore the effect of the group on self-concept and physical self-perceptions. Older women were underrepresented in the studies reviewed. No studies had evaluated the effect of exercise on older women's self-concept. It was decided to explore the effect of exercise, brisk walking, on older women's self-concept and physical self-perceptions; simultaneously the effect of the exercise setting on self-concept and physical self-perceptions would be explored in the context of older women. The TSCS was chosen to measure global and sub-domains of self-concept including physical, social, and personal selves. In addition an instrument was needed that would be valid and reliable when used to

measure older women's physical self-perceptions relevant to exercise participation. Thus, current physical self-perception instruments were reviewed. It was decided to validate the English version of the Self Perception in Exercise Questionnaire (Sorensen, 1999) on a sample of older Australian women prior to exploring exercise effects on older women's self-concept and physical self-perceptions.

Study 1 demonstrated the Self Perception in Exercise Questionnaire (SPEQ) to be a useful instrument for evaluating the relationship between exercise and self-perceptions purported in the literature to be important for exercise. The English version of the SPEQ was found to be specific enough to be affected by exercise experience in an older female sample which confirms previous findings and current expectations that it is general enough to be useful for a wide range of exercise participants. It appears to operationalize dimensions of self-concept considered important for exercise studies. Whether it is superior to other physical self-concept or self-perception measures, however, remains to be determined. Study 1 also added to current knowledge with regard to older women's self-referent thoughts in exercise. It demonstrated the importance of body perceptions in this population sub-group. Further research using the SPEQ is necessary to determine its usefulness in exercise-self-concept research and to increase knowledge of physical self-perceptions during and following exercise treatments. It was used in Study 2, together with the TSCS to further explore the exercise-self-concept association in a sample of older community-dwelling Australian women.

Study 2 formed the main body of work of the thesis. Because it was reported and discussed in detail earlier (see Discussion, p.161) this chapter will present only a summary of its findings relative to the thesis' four hypotheses (Chapter 1, p.8), and then focus attention on its theoretical implications. A major strength of this study was the high

adherence (91%) to the study protocol of the reasonably sized sample (N = 67) of older Australian women who appeared to be representative of this population sub-group (ABS, 2003). It reported a pre-post randomised controlled trial examining the effect of exercise and the exercise setting on the self-concept of older women. It employed a rigorous experimental design and statistical analyses, and a detailed exercise prescription.

As expected, exercise positively and significantly affected older women's self-concept following exercise performed either alone or in a group (*ES* = 0.71); Hypothesis 1.3.1. This finding extends previous exercise-self-concept research to older women. This positive result was achieved in the absence of a supervising exercise instructor; this has two implications. First, the treatment is cost effective. Second, the absence of an instructor or supervisor may have increased the women's feelings of personal control and intrinsic motivation which could explain the high adherence (91%) and high participation rates (95%) achieved in this study. However, closer inspection of the data revealed exercise effects on self-concept were significant only for the group exercisers compared to controls and not for the alone exercisers compared to controls. This suggests the combined exercise results were biased by the group exercise. Thus, it might be more accurate, and of clinical importance, to conclude *group* exercise positively affects older women's self-concept.

Reinforcing the present thesis' contention that improved self-concept following exercise is commensurate with increased psychological well-being, satisfaction with life also improved significantly for the older women who walked regularly either alone or in a group in Study 2, and further, effects were significantly greater when walk sessions were performed in a group compared to walking alone. This further suggests psychological benefits of exercise are greater for older women when the exercise is performed in a group setting. Satisfaction with life is generally considered a global well-being construct (e.g.,

McAuley et al., 2000; Rejeski & Mihalko, 2001). Its use is increasing as a measure of quality of life and psychological well-being (Lox, Martin, & Petruzzello, 2003). Of clinical significance a number of authors have suggested that the benefit of improved quality of life might be more motivating than physical gains to motivate older people to become and remain more active (e.g., McAuley et al., 2000; Stewart et al., 1993). Supporting this view, Ball et al. (2001) found walking companions were important correlates for walking for exercise in a survey of 3,392 urban Australians.

One further outcome of Study 2 which also has clinical implications is the finding that greater fitness improvements were experienced by the women who exercised in a group setting with similar others. Two measures of aerobic fitness improved significantly compared to controls for the women who walked in a group whereas the women who walked alone did not improve on either measure relative to controls. This was not as expected. Because the exercise prescription, which was considered aerobically beneficial for previously non-exercising older women, was exactly the same for both exercise conditions, walking alone or walking in a group, similar improvements were expected for both conditions. Suggested reasons for this finding were presented in Chapter 4 Discussion and will not be discussed further here, but briefly, it was concluded the group walkers complied with the prescribed exercise frequency, intensity, and duration but the alone walkers might not have. Instead, they might have walked less often, cut short some walks, and walked at lower intensity because they were not accountable to peers. Supporting this view they did not improve significantly on either of the two aerobic fitness measures compared to controls. This unexpected finding suggests group exercise may not only be more psychologically beneficial to older women, it also appears to be more motivating with regard to exercise prescription compliance, and consequently more beneficial for

aerobic fitness. It would be interesting to further explore this field and determine whether or not exercise is more enjoyable for older women when performed in a group setting. The superior benefits of the group setting may be found to be explained by enjoyment and intrinsic motivation as self-determination theory predicts. This is an important point, because intrinsic motivation has been positively associated with exercise maintenance.

Turning attention to the effect of the exercise setting on self-concept, the group setting was found to differentially and significantly affect older women's self-concept as expected; Hypothesis 1.3.2. As previously mentioned, self-concept improved significantly compared to controls for Group Walk but not for Alone Walk. In addition exercise effects on self-concept were larger for Group Walk (*ES* = 1.13) than Alone Walk (*ES* = 0.49). Exercise effects on physical self-perceptions were also found to be greater when exercise was performed in a group setting. Physical self-concept, and perceived body and perceived fitness all improved significantly for Group Walk compared to both Alone Walk and to controls. Significant improvements were not found in these variables for Alone Walk compared to controls. These findings suggest the group exercise setting might be one mechanism underpinning exercise-induced change in self-concept and further, perceptions rather than real change are mediating this effect. Change in perceived body and fitness accounted for more of the variance in self-concept change following exercise than real fitness and body change. This was as expected: Hypothesis 1.3.3. And further, real body and fitness change were not reliably associated with perceived change. These findings add to current knowledge of possible mechanisms underpinning the positive exercise-self-concept association reported in the literature and confirmed in the present thesis.

Study 2 results add partial support to the hierarchical structure of self-concept. Exercise effects on self-concept were found to be greater for certain physical self-percepts

and physical self-concept than for global self-concept. The group exercise condition provided the best support; effect sizes ranged from perceived body (*ES* = 1.38) to physical self-concept (*ES* = 1.29) to global self-concept (*ES* = 1.13). Parallelling these findings perceived body and fitness accounted for more of the variance in physical self-concept than in global self-concept, with perceived body accounting for 23% of the variance in physical self-concept compared to 1%-2% for real body measures. This latter result confirms the Study 1 finding of the importance of body perceptions to older women. Study 2 also demonstrated change is possible at the global level of self-concept, which has been argued by some authors as being a more permanent structure. Results also confirm the specificity of lower-order physical self perceptions and the view that they are amenable to change both during and following an exercise treatment. Results are also supportive of the view that self-concept is comprised of sub-domains and changes at the lower levels of the self-concept structure result in change at the global level.

As well as exploring the group setting as a possible mechanisms underpinning self-concept change, Study 2 also explored in a preliminary fashion the interrelated effects of real and perceived body and fitness on self-concept outcomes as an integral part of this group effect mechanism. A preliminary model (Figure 4, p. 76) which suggested exercise-induced change in physical self-perceptions would positively affect physical self-concept and then global self-concept was evaluated. Correlations between pre-post-change in real and perceived body and fitness, and global and physical self-concept for the older women who walked either alone or in a group were calculated and results are shown in Figure 4b.

Clearly, associations between physical and global self-concept are stronger for perceived change than for real body and fitness change. This was as expected and supports the growing number of authors who claim real fitness change is not necessary for change

in psychological variables such as mood and self-concept (e.g., Glenister, 1996; Jasnoski et al., 1981; King et al., 1989, 1993; Rejeski et al., 1996; Shephard, 1997). Rather it is some aspect of participating in exercise that is having an effect, as this thesis contends. Figure 4b also shows physical self-perceptions are more strongly correlated with the physical sub-domain of self-concept than with global self-concept which offers further support for the hierarchical structure of self-concept and parallels findings of McAuley et al. (1997) who found improvements in perceived physical condition and physical self-worth/esteem were greater for physical esteem, than for global self-esteem, in a sample of middle-aged adults. Reinforcing the importance of body perceptions to older women as found in Study1, the strongest correlations at both domain and global level, are with perceived body. It is also interesting to note, that although similar effect sizes were reported for real and perceived fitness (see Table 20, p.159) correlations are stronger for perceived fitness at both domain and global level of self-concept.

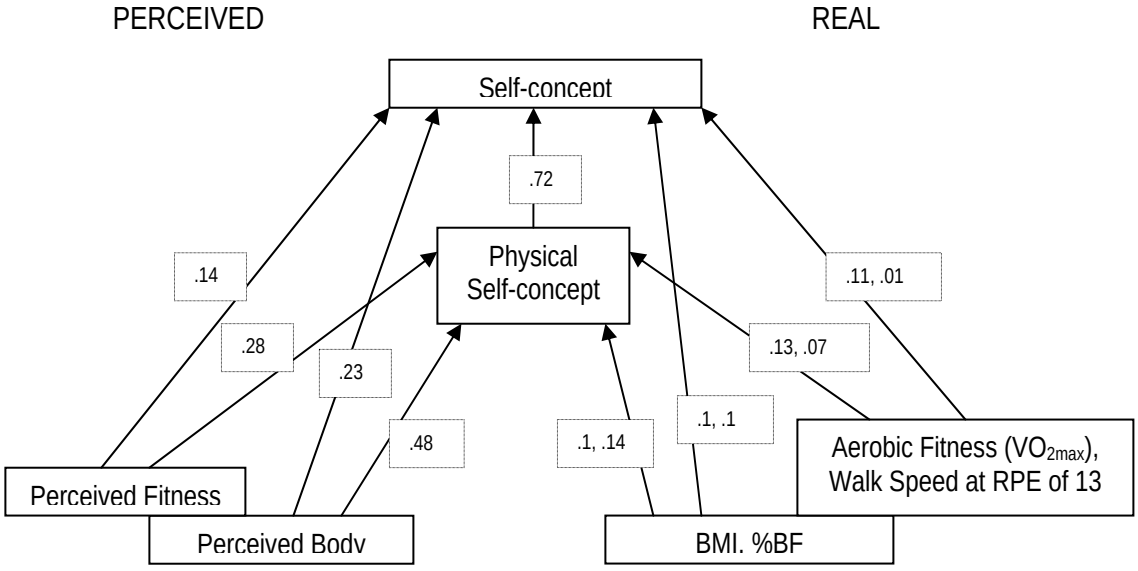

Figure 4b. Correlations between real and perceived body and fitness, and global and physical self-concept calculated in Study 2

The preliminary model further predicted that change in perceived body and fitness would be greater when the exercise was performed in a group setting and, in turn, change in physical and global self-concept would be greater in the group setting compared to performing exactly the same exercise alone; Hypothesis 1.3.2. As mentioned earlier, this did indeed happen as demonstrated by both effect sizes and multivariate and follow-up univariate analyses of variance, but we are unsure as to why it happened, although speculations were made in Chapter 4. It was suggested physical self-perceptions were affected by certain aspects of performing exercise in a group setting, including social support, social cohesion, enjoyment, positive reinforcement and feedback, and a sense of belonging together with acknowledgement. Measures of these variables are warranted in future studies in this area to determine which aspects of performing the exercise in a group setting may be differentially affecting specific physical self-perceptions. For example, task and group social cohesion and enjoyment which are currently not well understood with regard to older adults' exercise experiences could be assessed using current instruments (e.g., cohesion, Estabrooks & Carron, 2000; enjoyment, Kendzierski & DeCarlo, 1991) or items exploring specific social factors could be devised and presented at posttest. Alternatively structured interviews could be developed and used. Such investigations might determine whether or not older women's enjoyment of group exercise mediates self-determination and intrinsic motivation.

It is interesting to note that in epidemiological studies social factors have been found to have a profound effect on older women's mental health (e.g., Mishra, Brown, & Dobson, 2003) and also on physical activity initiation and adherence in older adults (Ball, Bauman, Leslie, & Owen, 2001; Booth, Bauman, & Owen, 2002). Enjoyment has also been suggested as a critical feature of exercise maintenance in older adults (Berger, 1988;

McMurdo & Burnett, 1992; Stevens et al., 2003) yet little research attention has been paid to the role of these factors relative to exercise-induced change in psychological variables in older men and/or women. In particular their influence on older women's exercise initiation and maintenance in the context of group exercise deserve further investigation. The field could benefit greatly from qualitative research using structured interviews as well as focus group discussions that would allow a better understanding of how older women view the benefits of group/alone exercise. In addition, we may be able to gain an understanding of psychological, environmental, and social consequences of exercise and the exercise setting on the whole person. Such a holistic understanding would enable health care providers and exercise physiologists to make better-informed decisions about potentially effective recommendations and detailed prescriptions for older women.

In conclusion, the present thesis examined the effect of exercise and the exercise setting on older women's self-concept. Its overriding purpose was to provide evidence of the psychological benefits of exercise for older women. Exercise was found to positively and significantly affect older women's self-concept. The exercise setting differentially affected older women's self-concept; effects were significantly greater when the exercise was performed in a group setting. It also found older women who walked regularly in a group with similar others experienced significantly improved social and physical self-concept, satisfaction with self and with life in general, and a positive increase in perceptions of their body and fitness. Taken together these findings suggest group exercise offers considerable psychological benefits to older women. The group exercise setting was also found to provide greater aerobic fitness benefits to older women. These are valuable and in most cases unique findings. They are reinforced by the high adherence (91%) and participation rates (95%) achieved in the walk trial.

What has this thesis added to the field of exercise-self-concept research and theory?

- Added a systematic review of exercise-self-concept literature 1970-2004
- Validated an exercise-self-perception instrument for older women
- Extended knowledge: positive exercise-self-concept link to older women
- Extended knowledge: older women expect to lose weight when they exercise
- Extended knowledge: weight loss difficult for older women with exercise alone
- Added new knowledge: group exercise setting positively affects self-concept
- Added new knowledge: group exercise more beneficial for older women
- Added to our understanding of the hierarchical structure of self-concept
- Added to understanding of the multidimensionality of self-concept
- Added to our understanding of older women's physical self-perceptions and the importance of body perceptions in this population sub-group
- Added to our understanding of change in self-perceptions in exercise over time: for weeks 1-12 perceived body/fitness change appears to be linear for group exercise
- Presented preliminary evaluation of a conceptual exercise-self-concept model which suggests the group exercise setting positively affects self-concept via significantly greater change in physical self-perceptions when the exercise is performed in a group with similar others

Important implications of the thesis are as follows:

- Group walking offers greater psychological and fitness benefits to older women compared to walking alone: we need to organise more informal community meeting points/times for older women to meet together for group walking
- For older non-exercising women, brisk walking (RPE 13) for 20-30 min 3 times a week for 12 weeks has the potential to raise aerobic fitness 19%, from Poor to Fair

- Older women may have a misconception of what moderate intensity entails: need public education including practical workshops and demonstrations
- Older women starting an exercise program expect to get fit, and to lose weight
- Exercise alone may not be enough for weight loss and low intensity might not be sufficient to raise fitness in older women: they also need dietary advice as well as a detailed exercise prescription in order to aid adherence and fulfil expectations
- Aesthetics of the exercise setting important to older women: approach local councils to develop walking paths in attractive locations with sponsorship/support from local businesses and state/national funding
- Body perceptions are important to older women as well as younger women, and perceptions become more negative with increasing age contrary to the commonly held view that people expect their bodies to decline with age and are therefore more accepting of their bodies. This may not be the case for older women.
- Older women have low ratings of their fitness. This suggests a need for counselling re future and hoped-for possible selves and developing exercise self-definitions so that older women can see themselves as “an exerciser”

Suggested future directions are as follows:

- Provide further evidence of the psychological benefits of exercise to older women to inform public health policy, health provision, and health promotion
- Develop evidence-based exercise protocols that are psychologically beneficial for older women

This thesis provides an important public health message:

- Regular walking, in a group with similar others, maintaining moderate intensity for 20-30 min, with adequate warm-up and cool-down, offers both psychological and aerobic fitness benefits to older women.

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Thanks for reading the thesis

Nancy and research assistants, 4th Year Health and Sports Science students, UNSW.

Sara, Lee, Nancy, Chris, Kim, and Gabby photographed at the end of a posttest session, May 2004.

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Appendix A1

Faculty of Medicine, School of Medical Sciences,

UNIVERSITY OF NEW SOUTH WALES, SYDNEY 2052

Pre-Exercise Medical Screening Form

This questionnaire asks you some questions about your health history and exercise risk factors.

The information you give will be treated as confidential. It will be used to guide us with your entry into the 12-Week walking research program.

Please return this form in the self-addressed postage-paid envelope provided.

Place a tick ✓ against the statements that are true for you in Section A and B:

Section A I have had:

-- a heart attack	-- coronary angioplasty	-- heart transplantation
-- heart surgery	-- heart valve disease	-- congenital heart disease
-- pacemaker/ implantable cardiac defibrillator/ rhythm disturbance	-- heart failure	-- cardiac catheterization

Section B

-- You experience chest discomfort with exertion.
-- You have musculoskeletal problems
-- You experience unreasonable breathlessness
-- You experience dizziness, fainting, blackouts.
-- You take heart medications.
-- You have musculoskeletal problems
-- You have concerns about the safety of exercise
-- You take prescription medication(s).
-- You are pregnant.
-- Your blood pressure is high
-- You take blood pressure medication.
-- You are diabetic or take medicine to control your blood sugar
-- You are a woman older than 55 years or you have had a hysterectomy or you are postmenopausal.
-- You have a close blood relative who has had a heart attack before age 55 (father, brother) or age 65 (mother, sister).

Section C

I declare that to the best of my knowledge the information given above is correct and that I have not withheld any information, which may affect my ability to exercise.

Signature: ……

PRINT NAME ……

Date ……

If you ticked any ONE of the statements in Section A you will need to take the Doctor Referral Form (attached) to your doctor and gain written clearance to exercise and return it to us before starting the walking program.

If you ticked two or more statements in Section B you will need to take the Doctor Referral Form (attached) to your doctor and gain written clearance to exercise and return it to us before starting the walking program.

Please see reverse side for Doctor Referral Form……

Reverse side of Appendix A1

Faculty of Medicine, School of Medical Sciences,

UNIVERSITY OF NEW SOUTH WALES, SYDNEY 2052

Doctor Referral Form

Your patient, ……., would like to participate in a Research Walking Program for older women being conducted in the School of Medical Sciences, Faculty of Medicine, University of New South Wales. After reviewing her responses to our pre-exercise medical screening questionnaire, we would appreciate your medical opinion concerning her participation in a 12-Week Walking Program. Participants will walk at low-moderate intensity for 35-45 minutes, three times a week, for 12 weeks. Each session will have a 10 minute warm-up and cool down.

-- I AGREE to the participation of this individual in a 12-Week Walking Program for older women

-- I DO NOT AGREE that this individual is a candidate to exercise

Doctor's signature: ……Date: ……

Doctor's name: ……

Telephone: ……..

If this individual has completed an exercise test, could you please provide the following:

a. Date of test ……

b. A copy of the final exercise test report and interpretation

Are there specific concerns or conditions we should be aware of before this individual engages in exercise as part of our research? Yes/No

If yes, could you please specify: ……

Thank you for your assistance.

A/Professor Stephen Boutcher

School of Medical Sciences

University of New South Wales

Sydney 2052

Phone: 02 9385 2877

To the participant: Please return this form in the self-addressed postage-paid envelope provided

Appendix A2

THE UNIVERSITY OF NEW SOUTH WALES

PARTICIPANT INFORMATION STATEMENT AND CONSENT FORM

Walking Alone Compared to Walking in a Group HREC Approval No. 03264

You are invited to participate in a study about how self-perceptions and fitness levels may change as a result of exercising regularly, either in a group or alone. The study is being carried out by Nancy Dickman, a PhD student, at the University of New South Wales under the supervision of A/Professor Steve Boutcher. You were selected as a possible participant in the study because you are a woman aged 55+ years who responded to one of our recruitment notices.

If you decide to participate, you will first complete the attached Pre-Exercise Screening Questionnaire and post it back to us in the envelope provided together with the Doctor Referral form if your responses indicate you need to gain your doctor's written consent to exercise. In about four weeks time, in the Department of Medicine at the University of New South Wales you will be asked to sign an informed consent form, indicating you have decided to take part in the study, then you will be given a comprehensive fitness assessment in our laboratory as well as walking outdoors, and then complete some questionnaires. This should take about two hours all up. These measures will be repeated in 12 weeks time. Also during the 3rd, 6th and 9th weeks we will send you via Australia Post a questionnaire to complete at home, which should take about 15 minutes, and post each questionnaire back to us in the pre-paid envelopes provided. Completion of any of the above fitness measures and questionnaires is voluntary. Your measures and responses will be kept confidential and anonymous; they will be coded using a participant number only (no names), for data analysis.

After completing the above measures you will be assigned to either Walk-in-A-Group, Walk-Alone, or a control group waiting to start a walking program in 12 weeks time. If you are assigned to Walk-in-A-Group you will meet with a group of other women of your age, and walk together, in small groups, around the University of New South Wales grounds.

If you are assigned to Walk-Alone Group you will go for a walk by yourself in a location of your choice or you may choose to walk around the University of New South Wales grounds. Walks will be conducted in the early morning or evenings on weekdays. You will be asked to walk for 40-50 minutes (including warm-up and stretching), three times per week at a low-to-moderate intensity for 12 weeks.

The Walk-in-A-Group, and Walk-Alone participants will undertake a guided 12-week walking program, as outlined above, comprising an orientation day before you begin, an instruction manual, a special Walking Research T-shirt, monthly postcard calendars, exercise logs and telephone calls to monitor your progress and answer any questions you may have at the time. The control group will be asked to maintain their normal lifestyle for 12 weeks before starting their walking program, and then receive the same treatment as outlined above for the Walk-Alone people.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission, except as required by law. If you give us your permission by signing this document, we plan to publish the results in an Exercise Psychology Journal or present the results at an Exercise and Sports Medicine conference. In any publication, information will be provided in such a way that you cannot be identified.

If you have any complaint concerning the manner in which this study is conducted it may be directed to the Ethics Secretariat, The University of New South Wales, SYDNEY 2052 AUSTRALIA (phone 9385 4234, fax 9385 6648, email ethics.sec@unsw.edu.au).

Your decision whether or not to participate will not prejudice your future relations with The University of New South Wales in any way. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without prejudice.
If you have any questions, please feel free to ask us. If you have any questions later, Nancy Dickman will be happy to answer them. Contact Nancy: Phone 02 9385 8710, Mobile 0402479101, or Email nancydickman@iprimus.com.au
Thank you for your interest in exercise research. This form is yours to keep.

Reverse side of Appendix A2

THE UNIVERSITY OF NEW SOUTH WALES

PARTICIPANT INFORMATION STATEMENT AND CONSENT FORM (continued)

Walking Alone Compared to Walking in a Group

You are making a decision whether or not to participate. Your signature indicates that, having read the Participant Information Statement, you have decided to take part in the study. Your signature also indicates that you have stated on the attached Pre-Exercise Screening form all your pre-existing health problems, injuries and all matters that may affect your participation in this study.

…… ……

Signature of Research Participant Signature of Witness

…… ……

(Participant: Please PRINT name)) (Witness: Please PRINT name)

…… ……

Date Nature of Witness

Signatures and Names of Investigators:

Steve Boutcher…….. Nancy Dickman……..

If you wish to receive a summary of the results of this research, please supply your contact details below,.
A summary will be posted or E-mailed to you, at the address you indicate, on completion of the study.

Name: ……..

Address: ……

…….. Postcode: ……..

E.mail: ……

REVOCATION OF CONSENT
Walking Alone Compared to Walking in a Group

I hereby wish to WITHDRAW my consent to participate in the research proposal described above and understand that such withdrawal WILL NOT jeopardise any treatment or my relationship with The University of New South Wales.

…… Date ……

Signature

……

Please PRINT Name

The section for Revocation of Consent should be forwarded to Nancy Dickman, Health and Sports Science, Faculty of Medicine, University of New South Wales, Sydney, 2052.

Appendix A2(cont.)

University of New South Wales

INFORMATION FORM

EXERCISE RESEARCH SURVEY

You are invited to participate in a study about the way older women think about exercise. You were selected as a possible participant in this study because you are woman aged 55-85 years.

If you decide to participate, you will be asked to complete three questionnaires in your own home. This should take between 30-50 minutes of your time. You will be asked to post your completed questionnaires back to us. A self-addressed postage paid envelope is provided.

You don't have to complete all the questionnaires at one time. You can take breaks whenever you need to. You are under no obligation to agree to take part, and you don't have to answer any questions you don't want to. However, if you can, we would very much like you to take part and answer all the questions fully and honestly. You can withdraw at any time in the future.

If you return the completed questionnaires to us, it will indicate to us that you consent to take part in this research project. Therefore, a separate consent form is not needed. Any information that is obtained in connection with this study will remain confidential. We may present the results at a conference, or publish the results in a psychology journal, or other publication in which information will be presented in such a way that individual participants cannot be identified.

This study has been ethically approved (Approval No 03326), but if you have any problems or concerns about the way the research is being conducted, contact the Ethics Secretariat, The University of New South Wales, Sydney, 2052. (9385 4234 or ethics.sec@unsw.edu.au)

We would like to answer all of your questions now, or any time later. Please contact Nancy Dickman, School of Psychology 93853215 or nancydickman@iprimus.com.au
Thank you for your interest in this research project. This form is yours to keep.

Appendix A3

THE UNIVERSITY OF NEW SOUTH WALES

Faculty of Medicine, School of Medical Sciences,

Participant Training Manual

Walking Alone Compared to Walking in a Group

Attach manual here

Appendix A4

Front of Postcard Calendar

Please keep this Postcard Calendar handy

Simply put an X in the days that you complete a walk session.

Send it back to us if you have to drop out. Otherwise bring it with you to post test. We hope it will help to keep you motivated.

The exercise research you have volunteered to take part in involves 12 weeks of regular brisk walking, with some tests before (pre-test) and after (post-test) plus an orientation day to learn all about what to do and how to do it, with time to ask questions before you start your walking
At the pre-test you will complete 3 written questionnaires and have a fitness assessment comprising 10 measures.

Your pre-test time is ……I will meet you in the foyer of Wallace Wurth Building, Faculty of Medicine (C27 on the map), 10 minutes before your appointed time. Nearest entry is Gate 9 or Gate 11 if you need car parking. Please wear comfortable clothes to walk in and supportive, rubber-soled shoes. You may need a water bottle and sunscreen and Hat for the outdoor walk, and bring your reading glasses for the questionnaires.

Orientation Day will be held on 1st March 7.30-9.30am. We will meet outside the Wallace Wurth Building Faculty of Medicine (C27 on UNSW map). Wear loose, comfortable clothes and supportive, rubber-soled shoes, as we will be walking for about 45 minutes. You will receive a Walking Manual and UNSW walking map as well as handouts with regard safety guidelines and monitoring your perceived walking intensity at somewhat hard, which is a brisk pace.
Please Note: If, for some reason, you have to leave the program early, please post this postcard calendar back to us, with an X in all the days you completed a walking session. We are very interested in all our participants. Thank you for participating, Nancy Dickman.

AFFIX
STAMP
HERE

Nancy Dickman
School of Medical Sciences
Health and Sports Science
Faculty of Medicine,
Wallace Wurth Building C27
University of New South Wales
SYDNEY 2052

Reverse side of Postcard Calendar

Postcard Calendar for Participant # ……..

- Please note carefully the dates and times for Pre-testing, Post-testing, and Orientation Day
- Alone-Walkers and Group-Walkers please pleas put a X in the days you do a walking session

Please bring this calendar with you when you come in for Post-testing OR send it back to us if you drop out early

	Monday	Tuesday	Wednesday	Thursday	Friday
	23rd February Pre-test UNSW at ……am	24th Feb Pre-test UNSW at……am	25th Feb Pre-test UNSW at……am		
Week 1	Orientation Day UNSW 7.30 a. m. 1st March	2nd March	3	4	5
Week 2	8	9	10	11	12
Week 3	15	16	17	18	19
Week 4	22	23	24	25	26
Week 5	29	30	31	1st April	2
Week 6	5	6	7	8	9 Easter
Week 7	12 Easter	13	14	15	16
Week 8	19	20	21	22	23
Week 9	26	27	28	29	30
Week 10	3rd May	4	5	6	7
Week 11	10	11	12	13	14
Week 12	17	18	19	20	21
	24th May Post-test UNSW ……..a.m.	25th May Post-test UNSW ……..a.m.	26th May Post-test UNSW ……..a.m.		

This research is being carried out by PhD student Nancy Dickman under the supervision of A/Prof Steve Boutcher, UNSW
If you have any questions phone Nancy 0402479101. Thank you for participating

Appendix A5

Participant Record Card: Physiological and Fitness Measures

Walking Alone Compared to Walking in a Group

Fitness Assessment for Participant Number…… Age: ……. Test Date:…../ …. / 2004

Treadmill RPE Training	Resting HR……..…… BP……../…...	RPE 9 HR ……..… Speed……	RPE 11 HR ……..… Speed……	RPE 13 HR……..… Speed……	Results HR at RPE 13 = Speed at RPE 13 =	Results **……..bpm** **……..km/hr**
Height (no shoes)	……..m					
Weight (no shoes)	……..Kg				Weight =	**……..Kg**
BMI*					BMI = ……	**BMI Group…**
%BF Skin Folds (* right side) (...cm….mm) % Body Fat Tanita Scales (no shoes)	Biceps* …….. …….. …….. Mean=……	Triceps* …….. …….. …….. Mean=……	Sub-scapula* …….. …….. …….. Mean=……	Mid-abdominal …….. …….. …….. Mean=……	Tanita Scale =	**……..%**
Handgrip (Kg)	R…….L……	R…….L…….			Mean of two trials R+L =	**……..Kg**
Leg Squat (each one 6 sec)					Total number completed =	**……..**
Sit-and-Reach (cm)	Warm Up	Trial 1……..	Trial 2……	Trial 3……	Best Performance =	**……..cm**
Abdominal Strength	Level 1 …….	Level 2 ……	Level 3 …….	Level 4 …….	Level reached =	**……..**
Rockport 1 Mile Walk	Time ……..min ……..sec	Time ……..…min	Finish HR ……..bpm		Estimated VO_{2max} =	**…….ml/kg/min**

* BMI Calculator http://www.cdc.gov/nccdphp/dnpa/calc-bmi.htm

** VO2max Calculator http://www.motivationstation.net/rockport.htm

Appendix A6

Pre-Testing Procedure
Walking Alone Compared to Walking in a Group

1. Meet and greet Participants in FOYER 7.15 / 9.15 – 7.25 / 9.25 am
2. Move to Room 210. Assistant to wait for latecomers and escort them to R210
3. 7.30 / 9.30 am R210 Nancy and one assistant
    - Informed Consent Refer copy of names and ID numbers
    - Demographics General Information
    - Quality of Life questionnaire – read instructions
    - SPEQ – read instructions
    - TSCS - read instructions
    - Send first two participants to R206 before 8.00am
    - Take unfinished questionnaires (and envelope) to complete at home/ R206
    - All leave R210 by 8.05 am
4. 7.45 / 9.45 am Research assistants (7) prepare R206. Equipment ready
5. 8.00 / 10.00 am Take RHR, BP, then start treadmill testing for first 2 participants
6. As Participants enter collect Record Cards and place age at top
7. Check Medical Clearance forms have arrived
8. Half to weigh and measure/ half to HR monitors ON
9. Proceed from station to station and complete all tests (10)
    - Shoes off, RHR, BP, Height, Weight, % Body Fat : 3 assistants
    - Hand-grip Strength, Leg Squat, Abdominal Strength : 3 assistants
    - Sit-and-Reach: 1 assistant. Put shoes back on, Put HR monitor on with female assistant helping
    - Treadmill RPE training Sip water as required: 2 assistants per treadmill
    - Keep HR monitor on for 1-Mile Walk outside: 4 assistants
    - Drink and toilet break
10. 8.50 / 10.50 am Experimenter (Nancy) collect cards of those finished all tests; 2 assistants proceed to Michael Birt Lawn with equipment and set up, check time Does anyone have car in 2 hour parking?
11. Nancy and 2 assistants remain to meet next group 9.15 am
12. 9.05 / 10.05 am start 1 Mile Walk; Instructions given; start one by one 20 seconds apart; anticlockwise
    - Walk as fast as you can, keep to outside witches hats, don't try to compete or "keep up" with others
    - Put participant number or name on palm card, pencil ready, record each lap as you pass the finish line
    - (12 laps to be completed)
    - Assistant will record your time and HR on your palm card immediately on finishing and collect your card.
    - You can stop any time, you don't have to finish if you don't want to.
    - OK to stop and start, stop to drink water, toilets / change rooms located adjacent to the lawn
13. 9.20 / 11.20 am – 9.35 / 11.35 am finish walk. Collect cards. Make sure cards have ID numbers.
14. Walk participants back to Wallace Wurth to collect belongings, drink, ttoilet, thank you
15. Ready in R 206 at 9.45 am for next group of participants
16. 1.30 – 3.00 pm scoring psychological questionnaires and coding and recording collected data

Appendix A7

Treadmill RPE Training Procedure

Walking Alone Compared to Walking in a Group

Instructions to Research Assistants (2 per treadmill): Before commencing: Record treadmill number and your name on participant's Record Card. Check RHR & BP are recorded on card. Check medications and contraindications on back of participant's Record Card. Beta-blockers? As test progresses: Record HR and speed for each RPE (9, 11, 13) as each is established. Test Time 12 minutes maximum.

Participant	Speed (Km/hr)	Duration	Research Assistant 1
Feet on belt Hands on side bars Start walking	0.00 1.00	20 sec 20 sec 1 min	Greet participant by name and introduce yourself, "Today I am going to ask you to walk at an easy to moderate pace/intensity. We'll start off easy…. How hard is that?" Show RPE Scale, keep walking Explain purpose of the test, "We want to find a walking speed that you feel is somewhat hard. We want you to know what a somewhat hard walking pace feels like for you, because this is the speed we want you to walk at when you go walking in the 12-Week Walking Program starting next week." Explain safety measures, "Sara/Rachel will have her hand at your back all the time. You can stop the test any time you wish."
Hands off bar Assistant 2: hand at participant's back	2.00 or 2.00+	20 sec 1 min	Now, a bit harder. How hard is that? Show RPE Scale Looking for a 9. Adjust speed by 0.5 Check HR not over safe limit for age
Support at back Hands off bar	3.00 or 3.00+	20 sec 1 min	Now, a bit harder again. How hard is that? Show RPE Scale Looking for an 11. Adjust speed by 0.5 Check HR not over safe limit for age
Support at back Hands off bar	4.00 or 4.00+	20 sec 1 min	We'll take it up a bit more. How hard is that? Show RPE Scale Looking for a 13. Adjust speed by 0.5 Check HR not over safe limit for age
Hands off bar Support at back	RPE 13 speed	20 sec 2 min	When RPE 13 is found "Could you walk for 20 min at this intensity? If YES … This is the somewhat hard intensity we want you to walk at in the Walking Program. We want you to remember what this intensity feels like. You're just starting to get a bit out of breath, but you still can talk. You may be starting to get a bit of a sweat up. It feels somewhat hard, but you can still continue."
Support at back Hold side bars	3.00	20 sec 1 min	Slowing down now…. How is that? Would you like a sip of water?"
Hold side bars	2.00	1 min	Looking for HR within <20 of RHR
Feet on sides	1.00	1 min	HR within <20 of RHR before stopping
Feet on belt TURN to back of treadmill. Walk S-L-O-W-L-Y Both elbows held by 2 assistants	0.00	1 min	"We will assist you to turn, take your time, walk slowly. Would you like to sit down? " Glass of water for participant. While assistant one starts talking to next participant, assistant two stays with participant until ready for moving to next testing station.

Appendix A7 (cont.)

RPE Scale used in Treadmill RPE Training Procedure

6	No exertion at all
7	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

Appendix A8

Orientation Day Procedure
Walking Alone Compared to Walking in a Group

7.15 am Meet the ladies in foyer Chat for a while

7.30 am Room 210

1. Welcome Thank you for volunteering … First some housekeeping
2. The envelope contains Training Manual, Monitoring Your Intensity handout and RPE Card to carry with you on each walking session, a map to to follow if you are walking at University of New South Wales and an Important Dates and Procedure handout, GROUP allocation.

   You already have Postcard Calendar to record your walking sessions
3. {New people have P'card Calendar with Participants number on it in kit and Qs also to complete after the walk.
4. BUT PLEASE SIGN CONSENT FORM RETURN NOW} …and Some Monday people need to complete one questionnaire
5. Please meet me back in the foyer downstairs after this morning's walk …also ..
6. Some Med Screening to follow up.
7. Now on to today's business (a) talk here till 8.10 am (b) walk (c) Room M207 Group-Walk Participants to discuss walk times plus the TSCS and Med Forms to be fixed up .. any further questions ..eg replace P'card Calendar if need be
8. About the program: Important Dates and Procedure ..What to do and when to do it..Handout
9. Explain again What each group is asked to do..Refer to Manual…
10. Participant Training Manual
    a. Correct walking technique Page 2
    b. Please read Safety issues and What to wear .. also an additional handout to read
    c. Timing it .. out and back..there are 3 PHASES Page 3
    d. Monitoring walking intensity ..remember what it felt like on treadmill ..read Page 4
    e. RPE Card .. carry it with you .. there is also an additional handout to read
    f. Recording ..Monitoring progress ..Logs in Manual + P'card Calendar Pages 5-8
    g. Stretching will be done outside .. Please read guidelines carefully Page 9
11. Stow bags and go walking ... Bring everything with you Bags to be left with students if in 1 mile walk or those coming walking with me leave them in my office downstairs … for the walk …Wednesday people to do the 1 Mile Walk others to come with me on Uni walk (remember to bring your University of New South Wales Map) and STRETCHING instruction for all.
12. Finish by 9.10am … all finished for today except for the Group-Walkers and the others I mentioned who will meet back in the foyer, collect bags, and we'll go to Room M207 and finish by 9.30 ..9.45 at the latest

8.15 am 1 Mile Walk on Micael Birt Lawn

Research Assistants place HR monitors onto participants and the course marked out first (equipment ready for you in Room 210). I need to do some more stuff in R210 (some of the Mon ladies have to complete page 2 of the TSCS). There may have too many ladies to count laps on the score sheet, so some can have a card and score their own, make sure they put their P number on it. Since we only have 15 Polar monitors some ladies will have to be measured manually. Decide who is going to record start-finish time on their card, and 15 sec HR at finish.I'll take the rest of the ladies on a practice walk down to the lower campus and back.

8.55 am If I'm not back by 8.55 when most assistants need to go to lectures, could you please go through the stretches from Training Manual with the ladies (they will all have one) and collect the Polar monitors. Send them to the Ladies Room to take them off.

9.00 am I'll go over safety etc Questions and individual problems will be sorted out in Room M207

10.00 am Finish

Appendix A9

Recruitment Notice

Faculty of Medicine,
University of New South Wales, Sydney 2052

Free 12-Week Exercise Program

Are you a woman aged 55-75 years?

Then you are just what we are looking for! **Phone Nancy 93858710**

We are a team of researchers, PhD student Nancy Dickman and Asscociate Professor Steve Boutcher, from the the University of New South Wales, Faculty of Medicine

We are looking for women aged 55-75 years to take part in a 12-week walking program

Walking either alone or in a group

We hope to find out if training alone or training in a group has any effect on the way older women view themselves overall, and how they view their fitness and their bodies in particular

Commencing 1st March 2004

What does it involve?

- A 12-week walking program for women 55-75 years currently not exercising for more than one hour per week
- You will be randomly allocated to a group to either walk alone, or walk with a small group of women of similar age/fitness as yourself, or wait to exercise
- You will walk at a moderate intensity, enough to get a sweat up, but still be able to carry on a conversation, for 40-50 minutes three times a week for 12 weeks
- You will be guided and monitored by a trained fitness leader

All participants will receive a complimentary research T-shirt, and a

Comprehensive Fitness Assessment before and after the Walking Program

If you would like to volunteer please phone Nancy Dickman

Voice-mail **93858710** and leave your name, contact details and any questions

Or you can Email nancydickman@iprimus.com.au

Appendix A10

THE UNIVERSITY OF NEW SOUTH WALES, Sydney 2052

Faculty of Medicine, School of Medical Sciences

MEDIA RELEASE

Date: ……

Free Exercise Program will Help Research

A University of New South Wales researcher is offering a free 12-week exercise program to 120 older women to find out if group exercise is more or less effective than exercising alone.

Nancy Dickman, a PhD student, is conducting the research under the supervision of Associate Professor Steve Boutcher.

Ms Dickman, a many times medallist in international and Australian Masters events has been involved in the fitness business ever since aerobic exercise took off in the early 1980s.

She says she has always been struck by observation and anecdotal evidence that people felt better as a result of exercising in a group, perhaps even when the actual level of individual fitness had not improved at all.

“This led me to wonder whether the exercise setting has an effect on people’s self-perceptions of their fitness level,” says Ms Dickman. “I want to find out the effect of exercise on a person’s view of themselves and if group training affects that concept of self.”

Volunteers will be formed at random into three groups:

- those doing 40-50 minutes of medium intensity walking by themselves in a location of their own choice three times a week for 12 weeks
- those doing the same walking program with a group of women of similar age and fitness as themselves, at the University of New South Wales
- control group who do not exercise for the first 12 weeks, but receive a free program afterwards.

Participants should be women aged 55 years or older currently not undertaking an exercise program for more than one hour per week. Volunteers can leave their names and contact details on Voice-mail 02 93858710 and they will receive an information package in the mail.

Media inquiries to Nancy Dickman nancydickman@iprimus.com.au Phone 0402479101

Participant Handout Appendix A11

Monitoring Your Exercise Intensity Using the Borg RPE Scale

Walking Alone Compared to Walking in a Group

One method of determining exercise intensity is the Borg Rating of Perceived Exertion (RPE). Perceived exertion is how hard you feel that your body is working. It is based on the physical sensations each person experiences during exercise, including increased heart rate, increased breathing rate, increased sweating, and muscle fatigue. Although this is a subjective measure, a person's exertion rating may provide a fairly good estimate of the actual heart rate during physical activity (Borg, 1998). Practitioners generally agree that perceived exertion ratings between 12 to 13 on the Borg Scale (shown below and on your yellow RPE Palm-card) suggest that exercise is being performed at a moderate level of intensity.

While walking in the Conditioning Phase (the middle part) of all of your walking sessions, we want you to rate your perception of exertion. This feeling should reflect how heavy and strenuous the exercise feels to you, combining all sensations and feelings of physical stress, effort, and fatigue. Do not concern yourself with any one factor such as leg pain or shortness of breath, but try to focus on your total feeling of exertion.

Through experience of monitoring how your body feels, it will become easier to know when to adjust your intensity. For this study, we want you to do moderate-intensity walking exercise, which means you will aim for a Borg Scale level of "somewhat hard" (13) during the Conditioning Phase (the middle part) of all of your walking sessions. If you rate your muscle fatigue and breathing as "very light" (9 on the Borg Scale) you would want to increase your walking intensity. On the other hand, if you felt your exertion was " hard" (15 on the Borg Scale) you would need to slow down your walking to get back to the moderate-intensity range of RPE 13.

Look at the rating scale below while you are walking; it ranges from 6 to 20, where 6 means "no exertion at all" and 20 means "maximal exertion." As described above, you can use this information to speed up or slow down your walking to reach your prescribed level of 13. Try to rate your feeling of exertion as honestly as possible. Your own feeling of effort and exertion is important, not how it compares to other people's effort. How you feel at the moment is important, not how you felt at any other time compared to the present time.

Rate of Perceived Exertion (RPE) Scale

6 No exertion at all	6 corresponds to "at rest"
7	
8	
9 Very light →	9 corresponds to "very light" exercise. For a healthy person, it is like walking slowly at his or her own pace. This is how you will walk during the Warm-Up (first 10 minutes of walking), and Cool-Down (last 5 minutes of walking) phases of each walking session.
10	
11Light	
12	
13 Somewhat hard →	13 on the scale is "somewhat hard" exercise, but it still feels OK to continue. You will not walk any harder than this during any of your walking sessions. You will walk at 13 during the Conditioning Phase (middle part) of all your walking sessions.
14	
15 Hard	
16	
17 Very hard →	17 on the scale is "very hard" or very strenuous. A healthy person can still go on, but he or she really has to push him or herself. It feels very heavy, and the person is very tired.
18	
19 Extremely hard →	19 on the scale is an "extremely hard" or strenuous exercise level. For most people this is the most strenuous exercise they have ever experienced.
20 Maximal exertion	

Exercise Prescription and Safety Guidelines

Walking Alone Compared to Walking in a Group

You must take care not to injure or strain yourself when you are exercising on the 12-week walking program. This is a low-impact moderate-intensity walking program, which means no jogging, running, or jumping. It has been especially designed for older women.
For your own safety we ask that you carefully read, and follow the following guidelines:

Don't do your walking session:

- If the weather is very hot, humid, or cold
- Straight after meals or drinking alcohol
- If you feel unwell, pain or dizziness
- If you feel unusually tired
- If you have the flu or a fever.
-

To make your walking safe and enjoyable:

- Wear comfortable loose clothes and supportive rubber-soled shoes
- Wear a hat, preferably broad-brimmed, sunscreen, and sun glasses
- Avoid the hottest times of the day
- Don't wait until you feel thirsty – drink plenty of water before, during and after your walking session
- Build up your walking time over the first five weeks of the program as outlined in your exercise prescription
- Stretch the major muscles of your lower body at the end of your walking session as described and illustrated in your Training Manual

Your F.I.T. exercise prescription:-

FREQUENCY

- 3 sessions per week

INTENSITY

For the first 10 minutes and the last 5 minutes of each walking session

- low
- this means your normal easy walking pace

For the 20-30 minutes conditioning phase (the middle part) of each session

- moderate
- this means you walk hard enough to make you a little sweaty and out of breath, but not uncomfortably so – you should still be able to carry on a conversation. If you can sing an opera aria, then you are not walking hard enough
- since moderate intensity is different for different people, you will be prescribed a rate of perceived exertion using a scale from 6 (at rest) to 20 (very, very, hard) OR a target heart rate if you wear a heart rate monitor (like a wrist watch) for some of your sessions.

TIME

- 40 to 50 minutes each session which includes warm-up walking for 10 minutes, brisk walking at your 12-13 perceived exertion rate for 20-30 minutes, 5 minutes cool-down walking, and 5 minutes stretching
- you are asked to increase your fitness walking time by 5 minutes for your first walk during week 3, and by a further 5 minutes in week 5. If you increase too quickly, you increase the risk of injury as well as losing motivation.

Important Dates and Procedures: What to Do and When to Do It

Walking Alone Compared to Walking in a Group

- February 23rd, 24th, 25th …… Pre-Testing at University of New South Wales

  You will complete 3 questionnaires and 10 physical measures in one 2-hour session by appointment

  Please wear suitable clothes (or bring a change of clothes) for walking (indoor on treadmill and outdoors)

- March 1st Mon. 7.30-9.30am …… Orientation Day at University of New South Wales

  Please wear suitable clothes (or bring a change of clothes) for walking outdoors.

  We will talk about what each group is expected to do and how to do it safely and at the required intensity. You will be told your group allocation on this day. The groups are:

  - Group-Walk: walk 3 times per week with other women at University of New South Wales
  - Wait-to-Walk: wait 12 weeks before starting to do the Walk-Alone program
  - Alone-Walk: walk 3 times per week by yourself in a location of your choice (or UNSW).

  You will receive your Walking Manual and other guidelines and instruction re stretching, recording your walking sessions, and monitoring the intensity of your walking sessions.

  We will finalise session times for group walks.

  We will end the Orientation Day with a practice walk and question time.

- March 1st – May 22nd ….. The 12-Week Walking Program START
- Group-Walk and Alone-Walk people will follow the instructions for each of the 12 weeks contained in the Walking Manual and record each walking session in their manual and on their Postcard Calendar. Walking intensity will be randomly monitored at least once during the 12 weeks using a Heart Rate Monitor (for Alone-Walkers I will organise this with you by phone). The Wait-to-Walk people will maintain their normal lifestyle for these 12 weeks and then start their walking program, following the Alone-Walk procedure.
- All three groups are asked to maintain their normal eating, and other lifestyle habits, during these 12 weeks.
- During the 12 weeks, the people in all three groups will receive telephone calls to monitor their progress, provide motivation, and answer any questions.
- During weeks 3, 6, and 9 the people in all three groups will receive via Australia Post a questionnaire to complete (should take about 10 minutes) and return in the self-addressed postage paid envelope provided.
- If you have any questions, at any time during these 12 weeks, don't hesitate to contact Nancy's voicemail 93858710 or Mobile phone 0402479101 or E.mail nancydickman@iprimus.com.au

- May 24th, 25th, 26th ….. Post-Testing at University of New South Wales

  The procedure will be exactly the same as the Pre-Testing in February before we started.

- May 31st …..Wait-to Walk Group START their 12-Week Walking program

- August 29th, 30th, 31st … Follow-up Testing for all people

  The procedure will be exactly the same as the Pre-Testing in February before we started.

Exercise Questionnaire

We want to know about you and your experiences concerning exercise. Remember that your responses are completely confidential and anonymous – you are only identified with a code number. You are under no obligation to complete every question. However, we'd really appreciate your honest answers because it will help us understand people's exercise experiences, and how this may be different for people of different ages and backgrounds.

Your Age: _____ (in years)

Your Weight: _____ (Stones & Pounds OR Kilograms)

Your Height: _____ (Feet and Inches OR Metres)

Are you……. (please circle)
Single?
Married?
Separated?
Widowed?
Divorced?
Have a partner?

Do you identify with a cultural, religious, or ethnic group? Yes / No
If yes, what group is it? _____

Are you currently employed? Yes / No
If yes please circle Full-time / Part-time
If you are employed, what kind of work do you do? _____

Do you have any physical or personal problems that make exercise difficult for you? Yes / No
If yes, could you please explain? _____

What is your highest level of education/ training? Please tick a box:

∀ Finished primary (elementary) school
∀ Intermediate Certificate OR School Certificate
∀ Leaving Certificate OR Higher School Certificate (HSC)
∀ Technical or Business College Certificate OR TAFE Certificate
∀ University Degree
∀ Postgraduate Degree
∀ Other …….. (please explain)

Imagine your doctor makes recommendations about becoming more physically active (this might already have happened to you). How likely or unlikely are you to do what is recommended?

- 4 very UNlikely	- 3 moderately unlikely	- 2 somewhat unlikely	- 1 slightly unlikely	0	+ 1 slightly likely	+ 2 somewhat likely	+ 3 moderately likely	+ 4 very LIKELY

How physically active or inactive do you think you are on a day-to-day basis at the moment?
Please rate how active you generally are by circling a number on this scale:

- 4 very INACTIVE	- 3 moderately inactive	- 2 somewhat inactive	- 1 slightly inactive	0	+ 1 slightly active	+ 2 somewhat active	+ 3 moderately active	+ 4 very ACTIVE

How healthy or unhealthy do YOU FEEL at the moment? Please rate how healthy you feel on the scale by circling a number:

- 4 very UNhealthy	- 3 moderately unhealthy	- 2 somewhat unhealthy	- 1 slightly unhealthy	0	+ 1 slightly healthy	+ 2 somewhat healthy	+ 3 moderately healthy	+ 4 very HEALTHY

How satisfied are you with your physical ability at the moment?
Put a number from the rating scale next to each aspect of your physical ability we have listed below to show how SATISFACTORY or UNSATISFACTORY you rate each aspect of your physical ability at the moment. For example, if you can stand on the top rung of a ladder without falling you'd put +4 next to "balance."

- 4 very UN satisfactory	- 3 moderately unsatisfactory	- 2 somewhat un satisfactory	- 1 slightly un satisfactory	0	+ 1 slightly satisfactory	+ 2 somewhat satisfactory	+ 3 moderately satisfactory	+ 4 very SATISFACTORY

_____ coordination
_____ balance
_____ endurance (you can keep going for a long time without stopping)
_____ posture
_____ muscle strength
_____ flexibility

How much physical activity do you have in a usual day?

This includes time spent at work, on housework, jobs, gardening, walking, shopping, and exercising. Please tick one box:

∀30 minutes a day
∀60 minutes a day
∀2 hours a day
∀3 hours a day
∀More than 3 hours a day

In the activity that you do each day how physically vigorous* or demanding** is it for most of the time?

0 NOT at all VIGOROUS or DEMANDING	1	2	3	4	5	6	7	8 VERY VIGOROUS or DEMANDING

* vigorous means you start getting out of breath because you're going hard at it without stopping and you wouldn't be able to carry on a conversation with someone.

** demanding means it is hard on your muscles, heart or lungs. For example your muscles would get so tired or you would be out of breath and you'd have to stop what you were doing.

How many days a week are you usually physically active? ..... days

Has your doctor ever recommended exercise to you? YES /..NO

If you answered YES, did you start to exercise? YES /..NO

If you answered 'NO', please explain……

Did your doctor give you a reason for starting exercise? YES /..NO

If YES, what was the reason?……

Research has already been conducted to understand people's experiences concerning exercise.

Exercise has been defined in a particular way. We need you to understand this definition so when people answer questions about "exercise" everyone knows what we mean and everyone answers the questions in the same way "EXERCISE" is defined as structured physical activity. This means you do it regularly, it is repetitive, and you have to organise things, or make some sort of plan to do the exercise.

Some examples of different forms of exercise are…

- jogging, running, cycling, deep-water aqua aerobics, high impact aerobics
- walking, swimming, shallow-water aqua aerobics, low impact aerobics, Pump classes
- gentle exercise, heart-moves, stretching exercises,Tai-chi, yoga, Pilates
- weight training, boxercise and circuit classes with weight machines

Exercise does not include day--to-day physical activities such as housework, shopping, or gardening.

Are you currently doing some form of exercise? YES/..NO

If YES, what form of exercise are you doing?…… (if more than one, just write down the main one)

How do you do your exercise? ALONE / IN A GROUP (please circle)

In a usual week how long would you spend doing your exercise? …….. hours

In the exercise you are now doing, how hard are you going physically for most of the time?

0 NOT at all VIGOROUSLY	1	2	3	4	5	6	7	8 VERY VIGOROUSLY

If you are not exercising at the moment, and you have never exercised in the past, we'd like to know why you decided not to exercise. Could you please explain why you have never started to exercise ?

.....

People have given many reasons for starting to exercise.

Please rate how important the reasons we have listed below are FOR YOU to start to exercise

(either in the past or for you to start exercising in the future if you have never started to exercise).

Put a number from the rating scale next to each reason to show how important each one is for YOU.

For example, if "to get fit" is very important reason for you to exercise, then you'd put +4 next to that reason.

- 4 very UN important	- 3 moderately un important	- 2 somewhat un important	- 1 slightly un important	0	+ 1 slightly important	+ 2 somewhat important	+ 3 moderately important	+ 4 very IMPORTANT

_____to get fit

_____to feel better about myself

_____to meet people

_____to stay young

_____to feel good mentally

_____for my health

_____to keep my weight stable

_____to improve my posture

_____to stop the ageing process

_____to look good physically

_____to improve my balance

_____to improve my thinking ability

_____for weight loss

_____to please someone else

_____to get out of the house

_____to get stronger

_____to look more attractive

_____to start something new

_____to improve my physical ability

_____to tone up my muscles

_____to have a good time

You can add other reasons of your own if you wish and rate them too:

_____…….. _____……

_____…….. _____……

People have given many different answers when asked what they EXPECT from an exercise program.

What do YOU expect to happen to YOU when, or if, you start to exercise regularly?

Put a number from the rating scale next to each item we have listed for you to show how LIKELY or UNLIKELY you think it will happen to YOU if you exercised regularly.

For example, if you think it is very likely that you would EXPECT to "become fitter" when you exercise regularly, then you'd put +4 next to that reason.

- 4 very UNlikely	- 3 moderately unlikely	- 2 somewhat unlikely	- 1 slightly unlikely	0	+ 1 slightly likely	+ 2 somewhat likely	+ 3 moderately likely	+ 4 very LIKELY

_____become fitter

_____become healthier

_____become stronger

_____become more flexible

_____become more attractive

_____enjoy myself

_____get other people's approval

_____stay young

_____feel pleased with myself

_____become more physically capable

_____feel better mentally

_____lose weight (body fat)

_____think more clearly

_____make new friends

_____stop getting old

_____keep my body weight stable

_____ look better physically

_____get more toned-up muscles

_____have better posture

You can add other expectations if you wish and rate them too:

_____…….. _____……..

_____…….. _____……..

That's all now!

Please place the completed questionnaire in the postage-paid envelope supplied, and post it back to us.

Thank you very much for taking part in this research

If you have any questions please contact ….....

Appendix B1

Tennessee Self Concept Scale Items used in Study 2 Walk Trial

Physical Sub-scale (14 items)
I am an attractive person
I have a healthy body
I consider myself a sloppy person
I am full of aches and pains
I am a sick person
I don't feel as well as I should
I am neither too fat nor too thin
I should have more sex appeal
I look fine just the way I am
I take good care of myself physically
I try to be careful with my appearance
I feel good most of the time
I am not good at games and sports
I have trouble sleeping

Social Sub-scale (12 items)
I am a friendly person
I am mad at the whole world
I am hard to be friendly with
I am as sociable as I want to be
I am satisfied with the way I treat other people
I ought to get along better with people
I am no good at all in social situations
I do not feel at ease with other people
I get along well with other people
I try to understand the other's point of view
I see something good in everyone I meet
I find it hard to talk with strangers

Personal Sub-scale (12 items)
I am a cheerful person
I am a nobody
I am a hateful person
I am losing my mind
I have a lot of self-control
I am just as nice as I should be
I am not the person I would like to be
I despise myself
I am satisfied to be just what I am
I try to run away from my problems
I can always take care of myself in any situation
I solve my problems quite easily

Academic/Work Sub-scale (12 items)
Maths is hard for me
I am not as smart as other people around me
It is easy for me to learn new things
I do well in maths
Other people think I am smart
I am not good at the work I do
I'll never be as smart as other people
I like to work with numbers
I can't read very well
I do as well as I want to at almost any job
I do not know how to work well
It's easy for me to understand what I read

Family Sub-scale (12 items)
I am a member of a happy family
My family would always help me
I am not loved by my family
I feel that my family doesn't trust me
I am satisfied with my family relationships
I understand my family as well as I should
I treat my parents as well as I should
I am too sensitive about things my family say
I should love my family more
I do not activity the way my family thinks I should
I take a real interest in my family
I quarrel with my family

Moral Sub-scale (12 items)
I am an honest person
I am a decent sort of person
I am a morally weak person
I am a bad person
I wish I could be more trustworthy
I am satisfied with my moral behaviour
I shouldn't tell so many lies
I am satisfied with my relationship with God
I have trouble doing the things that are right
I am true to my religion in my everyday actions
I sometimes do very bad things
I do what is right most of the time

Self-Criticism (8 items)
I get angry sometimes
Once in a while I think of things too bad to talk about
Sometimes when I am not feeling well, I am cross
Once in a while I laugh at a dirty joke
I gossip a little at times
Sometimes I feel like swearing
I'd rather win a game than lose one
Sometimes I put off til tomorrow what I should do today
-.

Supplementary scale; Satisfaction (21 items)
I don't feel as well as I should
I am neither too fat nor too thin
I should have more sex appeal
I look fine just the way I am
I am as sociable as I want to be
I am satisfied with the way I treat other people
I ought to get along better with people
I am no good at all in social situations
I am just as nice as I should be
I am not the person I would like to be
I despise myself
I am satisfied to be just what I am
I am satisfied with my family relationships
I understand my family as well as I should
I treat my parents as well as I should
I am too sensitive about things my family say
I should love my family more
I wish I could be more trustworthy
I am satisfied with my moral behaviour
I shouldn't tell so many lies
I am satisfied with my relationship with God

Self Perception in Exercise Questionnaire

Appendix B2

This questionnaire concerns your feelings and perceptions when you exercise. By exercise, we mean physical activity that requires more regular and systematic effort than going for a short walk or working in the garden or doing household chores. It may compare to what you know from physical education classes at school, taking part in aerobics or group fitness classes, jogging, regular walking, or more systematic sports training.

Please read the following statements and show how much or how little you agree with each by choosing and circling a number on the scale. Remember that there are no right or wrong answers and your responses are completely confidential and anonymous. You don't have to put your name on this form. Thank you for participating in this survey.

1. *I prefer doing exercise alone*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

2. *I have never liked exercise very much.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

3. *I think my body looks good.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

4. *I am not fit.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

5. *I find it exciting to see how much exercise I can do.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

6. *My body looks as good as anyone else's in my age group.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

7. *It worries me that I don't manage to keep fit.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

8. *I am almost repulsed by my own body.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

9. *Taking age into consideration, I am quite happy with my body.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

10. *Somehow, I show how capable I am when I participate in exercise.*

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

11. I find it difficult to concentrate on exercise when I am with others.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

12.. I am happier doing exercise when I don't have to take others into consideration.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

13. Exercise gives me a positive feeling of attaining something.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

14. I do better in exercise when I am with others.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

15. Exercise is important to me because it makes me feel I am in control of something.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

16. I like exercising with others.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

17. I think I am good at more types of exercise than other people.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

18. First and foremost, I think exercise is strenuous.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

19. I have a positive relationship with my body.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

20. I think I can get away from the daily stress of life by doing exercise.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

21. I don't think I should to be fitter.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

22. I think other people like their bodies more than I like mine.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

23. It's my belief that other people think my body looks unfit.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

24. I wish I was fitter than I am now.

- 2	- 1	0	+ 1	+ 2
disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree

Appendix B3

Participant # ------

Satisfaction with Life Scale

Listed below are five statements that you may agree or disagree with. Using the scale 1 – 7 below, please indicate your agreement with each item by placing the appropriate number on the line in front of that item. Please be open and honest in your responses. The information you give is confidential. You don't have to put your name on this form. Thank you.

7 – Strongly agree

6 – Agree

5 – Slightly agree

4 – Neither agree nor disagree

3 – Slightly disagree

2 – Disagree

1 - Strongly disagree

------ In most ways my life is close to my ideal.

------ The conditions of my life are excellent.

------ I am satisfied with my life.

------ So far I have achieved the important things I want in life.

------ If I could live my life over, I would change almost nothing.

Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985)

Participant # …… Appendix B4

THE UNIVERSITY OF NEW SOUTH WALES

PRE-EXERCISE QUESTIONNAIRE

Walking Alone Compared to Walking in a Group

We want to know about you and your thoughts about this exercise program. Please remember that your responses are completely confidential and anonymous – you are only identified with a code number. You are under no obligation to complete every question. However, we'd really appreciate your honest answers because it will help us understand how people feel about exercise and how this may be different for people of different ages and backgrounds.

Age: _____ (in years)

Are you … (please circle) Single?
Married?
Separated?
Widowed?
Divorced?
Have a partner?
Other?.....

Do you identify with a cultural, religious, or ethnic group? Yes / No
If yes, what group is it? ……

Are you currently employed? Yes / No
If yes, what kind of work do you do? Full-Time / Part-Time (please circle)

Are you currently retired? Yes / No

What is your highest level of education/ training? Please tick one box below.

□ Finished primary (elementary) school

□ Intermediate Certificate OR School Certificate

□ Leaving Certificate OR Higher School Certificate (HSC)

□ Technical College Certificate/ Diploma OR TAFE Certificate/ Diploma

□ University Degree

□ Postgraduate Degree

□ Other …….. (please explain)

Are you currently exercising more than one hour per week? Yes / No

If yes please explain……

Could you list your reason, reasons, for taking part in this 12-week walking program?

……..…… ……... ..…… ……..…….…….

Could you list your expectation(s) for this 12-week walking program?

……..…… ……... ..…… ……..…….…….

Participant # ………….　　　　Appendix B5

THE UNIVERSITY OF NEW SOUTH WALES

POST-EXERCISE QUESTIONNAIRE

Walking Alone Compared to Walking in a Group

Please answer the following questions as openly and honestly as you can. You can write on the back of this form if you need more room.

The information you give below will be treated confidentially and will not be released or revealed to any person. It may be used anonymously for statistical purposes only.

1. **During the past 12 weeks did you:**

Feel better about yourself *mentally*? YES/NO If YES please explain ……………………………………………………………………………………………………….

Feel better about yourself *physically* ? YES/NO If YES please explain ……………………………………………………………………………………………………

Only do the exercise you were asked to do? Or maintain your normal lifestyle if that was what you were asked to do. YES/ NO If NO please explain

……………………………………………………………………………………………………….

Start any other forms of exercise? YES/ NO If YES please explain ……………………………………………………………………………………………………

Start any healthful behaviours such as quit smoking or improve your eating habits? YES/NO

If YES please explain ………………………………………………………………………

2. **For participants who have completed 12 weeks of walking:**

Do you think you will continue some form of regular exercise? YES/ NO If YES please explain

…………………………………………………………………………………………..

Did you have trouble sticking to the program? YES/NO If YES or NO please explain

……………………………………………………………………………………………

Would you be willing to do a follow-up test in 12 weeks time (late August)? YES/NO

3. **Are there any other comments you would like to make?**

…………………………………………………………………………………………………….

…………………………………………………………………………………………………….

Appendix B6

Participant # …….

THE UNIVERSITY OF NEW SOUTH WALES

FOLLOW-UP QUESTIONNAIRE

Walking Alone Compared to Walking in a Group

Please answer the following questions as openly and honestly as possible. The information that you give will be treated confidentially. It may be used anonymously for statistical or scientific purposes.

It will help us understand why older women exercise, and the benefits of exercise for this group.

1. During the past 12 weeks did you:

- Feel better about yourself *mentally?* YES/NO If YES please explain ……

……

- Feel better about yourself *physically?* YES/NO If YES please explain ……

……

- Start any *new* healthful behaviours? YES/NO (e.g. quit smoking, diet) If YES please explain
- ……

2. What exercise did you do over the past 12 weeks?

- Walking YES/NO If YES did you walk? ALONE/ in a GROUP/ in a TWOSOME (please circle)

If you answered YES could you tell us how often you walked……

and how long were your walks?.....

and for how many weeks did you continue to walk? ……

How would you rate the intensity of your walks? ……

Any comments? ……

- Start a NEW form of exercise YES/NO (please circle) Was it? ALONE/ In a GROUP

If you answered YES could you tell us how often you did the exercise? ……

and how long was each session?.....

and for how many weeks did you continue this new exercise? ……

How would you rate the intensity of your new exercise? ……

Any comments? ……

3. What obstacles or barriers did you meet when trying to keep active (walking/exercising)?

……

4. What helped you to keep being active (walking/exercising)? ……

……

5. What NEW hobbies/activities did you start over the past 12 weeks? For example, did you enrol in a course at TAFE/evening college, take up dancing, or join a community group etc ……

……

That's all for now. Once again, thank you for participating. Research would be impossible without you! Nancy Dickman.

Participant # ……. Appendix B7

THE UNIVERSITY OF NEW SOUTH WALES

WEEK 3: ADHERENCE TO THE WALKING PROGRAM QUESTIONNAIRE

Walking Alone Compared to Walking in a Group

Please answer the following questions as honestly and openly as you can. The information you give on this questionnaire is confidential. It will help us understand why people might have trouble adhering to an exercise program. By adherence we mean sticking to an exercise program and doing the things you have been asked to do. You do not have to put your name on this form, only your participant number is needed.

1. Are you having trouble adhering to the walking program? YES/ NO (please circle)

2. Please indicate your level of adherence to the walking program:

I have been following the program: (please tick)

___Always ____Mostly ____Sometimes ____Never

3. Answer this question only if you answered <u>YES</u> to Question 1<u>:</u> Following is a list of possible reasons that people discontinue (stop) an exercise program. Please rate the two most important factors for you by placing a 1 next to the most important reason, and a 2 next to the second most important reason for missing a walking session(s).

___ lack of time
___ lack of enjoyment
___ family/friend matters
___ injury
___ illness
___ weather (e.g., too hot, too cold)
___ cost
___ location of the exercise venue
___ any other reason, please list _____

4. Answer this question only if you answered <u>NO</u> to Question 1: Following is a list of possible reasons why people continue to participate in an exercise program. Please rate the two most important factors for you by placing a 1 next to the most important reason, and a 2 next to the second most important reason for you to continue the 12-Week walking program.

___ health
___ fitness
___ enjoyment
___ weight loss
___ weight management
___ sleep better
___ feel better about myself
___ have more energy
___ any other reason, please list _____

That's all now! When you have completed this questionnaire please return it to us in the postage-paid envelope provided. Once again, thank you for taking part in this research. Nancy Dickman.

Participant # ……. Appendix B8

THE UNIVERSITY OF NEW SOUTH WALES

WEEK 9: ADHERENCE TO THE WALKING PROGRAM QUESTIONNAIRE

Walking Alone Compared to Walking in a Group

We are interested to know whether or not you have had any trouble sticking to the walking program of three sessions per week from Week 1 to the present. The weather, or how safe, pleasant, or convenient the place you are going to walk in, are some things which might have influenced or had an effect on whether or not you have gone out on your walking sessions. Please answer the questions below considering all your walking sessions so far.

By adherence we mean sticking to the walking program.

Remember, your responses will be anonymous we only need your participant number which we have already placed at the top of this page.

Tick one box for each question.

Has the weather (how hot, cold, rainy, windy, or sunny it is) influenced your adherence to your walking sessions?

No influence at all	Moderate influence	Strong influence	Very strong influence

Has the safety of the location you walk in (how safe or unsafe you think it is) influenced your adherence to your walking sessions?

No influence at all	Moderate influence	Strong influence	Very strong influence

Has the proximity of where you walk (how far or close to home or work it is) influenced your adherence to your walking sessions?

No influence at all	Moderate influence	Strong influence	Very strong influence

Has the aesthetics of the place you walk in (how pleasant or unpleasant it is) influenced your adherence to your walking sessions?

No influence at all	Moderate influence	Strong influence	Very strong influence

That's all now! When you have completed this questionnaire please return it to us in the postage-paid envelope provided.

Once again, thank you for taking part in this research. Nancy Dickman.

Graded Abdominal Strength Test Procedure Appendix C2
(Gore & Edwards, 1992)

Hand grip Dynamometry Procedure (Gore & Edwards, 1992)

Appendix C3

Appendix C4

Leg Squat to Chair Test Procedure

1. Stand 15 to 30 cm in front of a standard chair (seat height 50 cm), feet shoulder width apart and both heels on the floor. Heels remain on the floor throughout
2. Cross arms on chest and maintain a flat back from top of head to tail-bone
3. Squat down slowly (as research assistant counts 1-2-3-4 seconds) until buttocks just touch the chair seat. Do not sit, keep chin up, look straight ahead
4. Take four seconds for the down phase and two seconds (assistant counting) for the up phase of each squat
5. Do not allow knees to extend forward farther than toe-line
6. Buttocks lightly touch the chair seat on every squat but do not remain in contact
7. Participant performs two practice squats to ensure correct technique and timing
8. Assistant records the number of leg squats perfectly performed
9. If balance is lost, participant does not touch chair seat, experiences knee pain, or goes faster than 6 seconds per squat the test ends

Strength Fitness Female Grading	50-59 years	60-69 years	70-79 years
Low	6-8 repetitions	3-5 repetitions	0-2 repetitions
Below average	9-11	6-8	3-5
Average	12-14	9-11	6-8
Above average	15-17	12-14	9-11
High	18-20	15-17	12-14

Sit-and-reach test procedure
(Gore & Edwards, 1992)

Appendix C5

Appendix C6

Protocol for Estimating Aerobic Power, VO_{2max}
Using the Rockport 1-Mile Walk Test

Test protocol

The walk is conducted outdoors on a measured one mile course usually laps of a sporting oval

Participants wear a Polar HR monitor or HR can be measured manually (beats for 15 sec X 4)

- Walk 1 mile as quickly as you can
- Walk, no running or jogging
- Record time for the mile from Polar HR monitor immediately following the walk and
- Record heart rate from Polar HR monitor immediately following the walk
- Then complete one of the following formulae (pounds or kilograms) to estimate VO_{2max}

Estimated VO_{2max} (ml/kg/min) = 132.853 - (0.0769 **x** body weight in [pounds])

- (0.3877 **x** age [years]) + (6.3150 **x** gender [female = 0; male = 1])
- (3.2649 **x** 1-mile walk time [in minutes and hundredths])
- (0.1565 **x** 1-minute heart rate at end of mile walk [beats per minute]

Estimated VO2 max (ml/kg/min) = 132.853 - (0.16928**x** body weight in [Kg])

- (0.3877 **x** age [years]) + (6.3150 **x** gender [female = 0; male = 1])
- (3.2649 **x** 1-mile walk time [in minutes and hundredths])
- (0.1565 **x** 1-minute heart rate at end of mile walk [beats per minute]

On the basis of the validity (R= .88) and standard error of estimate (5.0 ml/kg/min), we can be about 68% sure that true VO_{2max} is (+ / -**)** 5.0 ml/kg/min of the calculated value e.g. if estimated VO2 max is 40 ml/kg/min there is a 68% likelihood that the actual value is between 35 and 45.

Appendix D1

Table 15a

Exercise vs. No Exercise

Measure	Independent Samples *t*-test	MANOVAs			Pre-Post CHANGE				ANOVAs	
					Exercise (A+G) (n=42)		NoExercise (W) (n=19)			
	p	Significance			Mean		Mean		Significance	Ex/ NoEx
	Ex/No-Ex	*F*	*p*	(Lev'sSig)	Change	SE	Change	SE	*F* (1,59)	*p*
Domain1: Self-concept		*mF*= 3.03 *p* = .037								
Total self concept	.012	6.801	.012	(.032)	9.88	2.391	0.105	2.073	6.801	.012*
Physical self concept	.016	6.116	.016	(>.05)	2.88	0.84	-0.53	0.856	6.116	.016*
Social self concept	.019	5.824	.019	(.003)	2.12	0.667	-0.42	0.509	5.824	.019*
Domain 3: Satisfaction		*mF*= 6.188 *p* = .004								
Satisfaction (TSCS)	.030	4.93	.030	(>.05)	2.90	0.86	-0.53	0.853	5.441	.023*
Satisfaction with Life	.012	6.79	.012	(>.05)	0.39	0 .71	-0.105	0.19	6.79	.012*
Domain 2: Self-perceptions		*mF*=4.57 *p*= .033								
Perceived Mastery	.019	5.776	.019	(.035)	-0.398	0.062	-0.045	0.209	5.776	.019*
Perceived Body	.003	9.970	.033	(>.05)	0.473	0.084	-0.015	0.135	9.97	.003**
Perceived Fitness	.030	4.947	.030	(>.05)	0.655	0.078	0.263	0.198	4.947	.030*
Perceived comfort	.83	nsd								
Domain 4: Aerobic		*mF*=5.80 *p*= .005								
VO2max estimated	.027	5.171	.027	(>.05)	3.715	0.739	-0.959	0.753	5.171	.027*
Walk speed RPE13	.004	9.177	.004	(>.05)	0.643	0.119	0.037	0.135	9.177	.004**
Domain 5: Strength		nsd								
Hand grip	.844									
Leg squat	.775									
Abdominal strength	.053									
Domain 6: Body		nsd								
Body Weight	.071									
BMI	.115									
%BF	.160									
RHR	.511									

Note: nsd = no significant difference

Appendix D1

Inferences drawn from MANOVAs, ANOVAs, ANCOVAs

analyses of pre-post difference scores for Exercise (A+G) compared to No-Exercise (W)

	ANCOVAs		
	Significance		Ex/NoEx
	F	(Lev'sSig)	*p*
Significant effect for Domain 1: SELF-CONCEPT			
Exercisers experienced significantly improved TOTAL self-concept compared to No-Exercise W controls	6.687	(.022)	.012
Exercisers experienced significantly improved PHYSICAL self-concept compared to No-Exercise W controls	6.375	(>.05)	.014
Exercisers experienced significantly improved SOCIAL self-concept compared to No-Exercise W controls	7.228	(>.05)	.009
Significant effect for Domain 3: SATISFACTION			
Exercise experienced significantly improved satisfaction with self compared to No-Exercise W controls	4.996	(.020)	.029
Exercise experienced significantly improved satisfaction with life in general compared to No-Exercise W controls	6.362	(.016)	.003
Significant effect for Domain 2: SELF-PERCEPTIONS in exercise			
Perceived mastery decreased significantly for women who exercised compared to No-Exercise W controls	1.316	(>.05)	nsd
Perception of body became significantly more positive for women who exercised compared to No-Exercise W controls	10.060	(>.05)	.002
Perceived fitness increased significantly for women who exercised compared to No-Exercise W controls	3.807	(>.05)	.056
	0.217	(>.05)	nsd
Significant effect for Domain 4: AEROBIC fitness			
VO2max increased significantly for women who exercised compared to No-Exercise W controls	7.191	(>.05)	.010
Treadmill walking speed at RPE13 increased significantly for women who exercised compared to No-Exercise W controls	8.937	(>.05	.004
No significant effect for Domain 5: STRENGTH fitness			
No significant effect for Domain 6: BODY fitness			

Appendix D2

Table 16a Summary of all Analyses Walk Trial Study 2 Effect of the Exercise Setting on Self-concept (i.e., Alone vs. Group vs. Wait)

Summary Analyses Alone vs. Group vs. Wait	MANOVA	ANOVA		post hoc	post hoc	post hoc	ANOVA		ANCOVA	Mean Pre-Post Change
Pre-Post difference scores on: Measures	MANOVAs on/ 6 domains Significance (Lev"sSig)	Group	Effect	A Vs W	G Vs W	A Vs G	effect of age by group	Inference from results of ANOVA one-way between groups	ANCOVA	A (SD) G (SD) W (SD)
Domain 1:	*mF*= 3.339 *p*=.005	*F*(2,58)	*p*	*p*	*p*	*p*		Signif effect for Domain 1:Self-concept	A,G,W (Lev'sSig)	
TOT self concept (TSCS)	F=6.325 p=.003 (.038)	6.325	.003**	nsd	.003**	nsd	nsd	Signif group effect for TOTsc with G improving signif compared to W	F=6.029 (.019) p=.004	5.75±13.23 15.39±16.92, .11±9.0
PHYSICAL self concept (TSCS)	F=9.114 p=.000 (>.05)	9.114	.000***	nsd	.000***	.005**	nsd	Signif group effect for PHYsc with G improving signif compared to A and W	F=7.516 (>.05) p=.001	.83±4.341 5.61±5.669 .53±3.73
SOCIAL self concept (TSCS)	F=3.801 p=.028 (.008)	3.801	.028*	nsd	.024*	nsd	nsd	Signif group effect for SOCIALsc with G improving signif compared to W control	F=4.211 (>.05) p=.020	1.46±4.054 3.00±4.627 .42±2.2
Domain 3:	*mF*= 6.07 *p*=.0001							Signif effect for Domain 3: Satisfaction		
Satisfaction with Life scale (SwL)	F=7.507 p=.001 (>.05)	7.507	.001**	nsd	.001**	.021*	nsd	Signif group effect for SwL with G improving signif compared to both A and W	F=6.353 (>.05) p=.025	.150±.633 .7037±0.79 .105±.5.5
SATisfaction with Self (TSCS)	F=4.066 p=.022 (>.05)	4.066	.022*	nsd	.019*	nsd	nsd	Signif group effect for SATsc with self G improving signif compared to W	F=3.698 (.027) p=.034	1.63±4.55 4.61±4.77 .53±3.717
Domain 2:	*mF*= 5.761 p=.0001							Signif effect for Domain 2: Self-perceptions		
Mastery (SPEQ)	Nsd (.052)	2.844	.066	nsd	nsd	nsd	nsd	No significant difference between groups on perceived exercise mastery	nsd	-.404±.47 -.389±.281 .0451±.749
Body (SPEQ)	F=10.923 p=.000 (>.05)	10.923	.000***	nsd	.000***	.006**	nsd	Signif group effect for P.body with G improving signif compared to both A and W	F=9.362 (>.05) p=.000	.250±.42 .7698±.561 .015±.5869
Fitness (SPEQ)	F=6.335 p=.003 (.015)	6.335	.003**	nsd	.003**	.028*	nsd	Signif group effect for P.fitness with G improving signif compared to both A and W	F=4.606 (>.05) p=.014	.438±.543 .944±.251 .263±.86
Social (SPEQ)	F=4.932 p=.011 (>.05)	4.932	.011*	nsd	nsd	.008**	nsd	Signif group effect for P.social with A decreasing signif compared to G (A felt less comfortable in a group situation, infers more comfortable walking alone)	F=11.820 (>.05) p=.000	-.766±.872 .1222±.792 .442±1.05
Domain 4:	*mF*=3.553 *p*=.009							Sign effect for Domain 4: Real Fitness Aerobic		
VO2max (estimated)	F=3.454 p=.038 (>.05)	3.454	.038*	nsd	.033*	nsd	nsd	Signif group effect for estimated VO2max with G increasing signif compared to W	F=4.461 (>.05) p=.016	2.93±5.27 4.722±4.03 .959±3.279
Treadmill speed@RPE13	F=5.722 p=.005 (>.05)	5.722	.005**	nsd	.004**	nsd	nsd	Signif group effect for walk speed@RPE13 with G increasing signif compared to W	F=6.047 (>.05) p=.004	.50±.680 .8278±.87 .0368±.5899
Domain 5:	nsd							NO Sign effect Domain 5: Real fitness Strength		
L-body strength Leg strength										
U-body strength Hand grip										
Sit-Up Abdominal strength										
Domain 6: HR BP %BF weight BMI	nsd							NO Significant effect for domain 6: REAL Body		

Note: Bonferroni test used in all Post hoc tests

Key: A Alone Walk, G Group Walk, W Wait-to-Walk control, nsd non significant difference, P.body Perceived body condition, P.fitness Perceived fitness, P.social Perceived comfort/discomfort in the exercise situation,

Appendix D3

Table 21. Summary of Exercise/Physical Activity and Psychological Well-being/Mental Health reviews, articles, surveys, and meta-analyses 1980-2004

Author(s, date	Type of study	Variables examined	Conclusions drawn by authors
Folkins & Sime, 1981	Review	Physical fitness training and mental health	Research suggests physical fitness training leads to improved mood, self-concept, and work behaviour. Except for self-concept, personality traits are not affected by improved physical fitness.
Hughes, 1984	Critical review of controlled studies with >9 subjects	Psychological effects of habitual aerobic exercise (min 3wks/3pw) on mood, personality, and cognition	Controlled experiments verify exercise improves self-concept. They do not indicate exercise improves anxiety, depression, body image, or cognition.
Van Andel & Austin, 1984	Review	Relationship between physical activity and selected mental health variables	In non-clinical studies the most significant effects of exercise have been on depression and anxiety. Depression and anxiety influenced by physical activity in non-clinical populations.
Sonstroem, 1984	Review	Exercise effects on self-esteem	Found consistently positive results, but it is only scores increasing not necessarily self-esteem per se.
McAuley, 1984 (In Bouchard et al. 1993)	Overview of recent reviews	Physical activity and psychosocial outcomes: Exercise and physical activity effects on self-esteem	Some evidence, notwithstanding plethora methodological problems, for a +ve association between physical activity and self-esteem. A need for multidimensional theoretical frameworks and assessment relative to the physical activity in question. Need to measure domain-specific and aspects of importance to the individual.
Morgan & Goldston, 1987	Book	Exercise and mental health	Exercise has beneficial emotional effects across all ages and both sexes
Gruber, 1986	Meta-analysis	Meta-analysis (N=27 studies) Physical activity and self-esteem development in children	Overall effect size of physical activity on children's self-esteem 0.41. Self-esteem increased in 61% studies. Self-esteem higher for active c/f inactive children. Larger effect for aero. exercise. Duration not a moderator.
Crews & Landers, 1987	Meta-analysis	Stress reactivity	Exercise has beneficial effect on mental health. Effect of aerobic fitness on stress reactivity *ES* =.48
Brown & Lawton, 1986	Survey	Role played by exercise in stress response of adolescent females	High stress has negative impact on wellbeing of low-Intensity exercisers. No effect on high-int. exercisers.
Wetzler & Ursano, 1988	Survey (5962M/356F) Air-force personnel	Relationship between health practices and psychological wellbeing	Minor relationships between all health practices and wellbeing. Active males and less-active females had higher wellbeing.
Seggar et al., 1988	Survey (323F)	Relationship between physical activity and psychological wellbeing	Degree of activity participation not related to happiness, contentment, or life satisfaction.
Gauvin, 1988	Survey of exercisers, non-exercisers, and drop-outs	Relationship between activity level and subjective wellbeing (i.e., positive and negative affect and life satisfaction)(54M/68F,M=33 yrs)	No relationship between activity level and subjective wellbeing

Author(s, date	Type of study	Variables examined	Conclusions drawn by authors
Stephens, 1988	Survey 4 populations:	Validity of the physical activity-mental health relationship Positive and negative affect, depression, general wellbeing, health opinion, Blue-Cheer index. Four populations in USA and Canada 6913 aged 25-74 yrs; 23791 aged 15+ yrs; 3025 aged 20-64 yrs; 22250 aged 10+ yrs	Greater levels of physical activity associated with less depression, more positive affect, less negative affect, and general wellbeing. Relations stronger for older rather than younger groups, and for females rather than males. Choice or quality of activity may influence any psychological benefits of exercise.
Brown, 1992	Overview of research	Physical activity, ageing, and psychological wellbeing	Methodological problems, a paucity of well-controlled studies, and equivocal findings make it premature to conclude that physical activity leads to enhanced mental health in elderly persons
Brown & Siegel, 1988	Survey (212F; M=14 yrs)	Effect of exercise and stress on illness	Effect of stress on illness is moderated by vigorous exercise.
Ross & Hayes 1988	Telephone Survey IL,USA (N=401; 18-83 yrs)	Relationship between psychological wellbeing (anxiety/depression), socio-demographic variables, and exercise.	Moderate effect of exercise participation on psychological wellbeing when controlling for socio-demographic influences.
North et al., 1990	Meta-analysis (N=80 studies;1969-1989)	Effect of exercise on depression	Reduced depression (ES=.53) after exercise for males and females of all ages across survey and experimental studies in clinical samples.
McDonald & Hodgdon, 1991	Meta-analysis	Psychological effects of aerobic exercise training (anxiety, depression, mood, personality, self-concept)	*ES* = anxiety .47; depression .53; self-esteem .35; personality adjustment (various measures).33, self-concept .56 Clear relation between exercise and positive mood but relationship is complex. Higher self-concept for exercisers regardless of age /gender. Majority of studies young adult samples, with mid-aged, older samples rarely considered
Int. Society of Sport Psychology, 1992	Consensus statement	Exercise and mental health	Exercise improves mental health
Petruzzello et al., 1991	Meta-analysis	Meta-analysis of the anxiety reducing effects of exercise	Exercise has beneficial effect on mental health. *ES* = trait anxiety .34; state anxiety .24. Mechanisms not clear.
Gleser & Mendleberg, 1990	Review	Effect of exercise and sport on mental health Compared therapeutic exercise and sport with traditional therapies	Despite methodological limitations, physical activity (or associated factors) effective treatment modality, less costly No clear evidence that exercise alone is responsible for positive effects, underlying mechanisms not understood May also bring other additional psychological and social benefits. Reported improved self-concept.

Type of study Variables examined Conclusions drawn by authors

Table 21 (cont)

Author(s, date	Article		
Biddle, 1995b	Exercise-psychosocial health	Anxiety and stress reactivity, depression, self-esteem/self-concept, personality and adjustment, cognitive functioning	Within the limits of measurement, definitions, and methodology, the literature supports a relationship between exercise and psychosocial health.
Landers & Petrzzello, 1994	Review	Physical activity, fitness, and anxiety	Consistent link between exercise and anxiety reduction, regardless of anxiety measures taken (state/trait, behavioural, or physiological) or exercise regimen (acute, chronic)
McAuley & Rudolph, 1995	Review	Exercise and physical activity effects on psychological wellbeing in older adults	Overall results of the 38 studies reviewed were overwhelmingly positive, with the majority reporting an association between physical activity and psychological wellbeing. Gender not a mediating variable. Physical activity per se may not be responsible for SWB improvement. Fitness improvement and psychological improvement not related Measurement of psychological wellbeing is inconsistent.
Long & Stavel, 1995	Meta-analysis	Effect of exercise on anxiety	Aerobic exercise training programs were effective in reducing anxiety, esp. among those experiencing work stress
Murtrie & Biddle, 1995	Book chapter	Effects of exercise on mental health in non-clinical populations	Despite methodological problems found support the psychologically therapeutic effects of exercise but nature of these effects is unclear
Glenister 1996	Review	Exercise and mental health (N=11 RCT trials 1980-1995)	Suggests a causal relationship between exercise and mental health based upon 11 randomised controlled trials involving clinical and non-clinical samples in various settings
Spence & Poon, 1997	Meta-analysis	Effect of physical activity on self-concept (N=73 studies, 30 published, 43 unpublished)	Physical activity participation results in small significant improvements in global self-concept average *ES*=.25 (73studies) Moderators of self-concept: *ES* males .29 females .19; aerobic.19 strength .33; fitness change .3 no fitness change .12
Fox, 1999	Review	Influence of physical activity on mental wellbeing	Overall, moderate regular exercise should be considered a viable means of treating depression, anxiety and improving well-being in general population. Specifically, exercise clearly beneficial in treating depression, moderate beneficial in reducing state/ trait anxiety, weaker benefit cognitive functioning of older adults, can improve physical self-perceptions and global self-esteem, and aerobic and resistive exercise can improve mood. Little support for exercise addiction
Scully et al., 1998	Review	Physical exercise and psychological wellbeing Depression, anxiety, stress response, mood, self-esteem, body-Image, and menstrual syndrome	Positive influence on depression and anxiety. Aerobic exercise (20 min+) may enhance stress response (esp. at work). Both aerobic and non-aerobic associated with elevated mood (esp. in clinical samples). Mechanisms to be explored. Global self-concept/self-esteem small change, greater change at physical sub-domain level

Table 21 (cont)

Author(s), date)	Type of study	Variables examined	Conclusions drawn by authors
Hassmen et al., 2000	Population survey Finland	Physical exercise and psychological wellbeing	Consistent association between enhanced psychological wellbeing, as measured using a variety of instruments, and regular exercise.
Paluska & Schwenk, 2000	Review	Effects, mechanisms, and potential benefits of using physical activity as a component in the treatment of depression and anxiety.	Physical activity may play a role in the management of mild-moderate depression and anxiety, both aero and strength exercise are effective. Link between depression and inactivity. Studies of older adults are limited. Mechanisms suggested, but no consensus. Need controlled studies to address directly the process involved in exercise-mental health benefits.
Dunn et al., 2001	Review	Dose-response relations between physical activity-mental health	Evidence is mixed even in the better designed longitudinal studies. Earlier depression studies more positive than later.
Fox, 2000	Review	Self-esteem, self-perceptions, and exercise (N=79 studies; 37 random, 42 non-random)	Methodological inadequacies plentiful. Well-designed studies not plentiful. Exercise improves self-worth, self-perceptions. Self-esteem improvement in 50% studies. Greatest improvement in initially low self-esteem. Positive effects males and females of all ages, but greatest in children and mid-aged. Both aero exercise and strength training affect self-perceptions positively.
Lawlor & Hopker, 2001	Review	Exercise as a therapy for depression (N=14 clinical studies)	Overall effects cannot be determined because of lack of quality research in clinical populations. Mechanisms not well understood. Need more randomised controlled trials.
McGannon & Poon, 2002	Meta-analysis	Exercise and self-esteem: effects of global and domain-specific	Small, significant improvements in self-esteem following exercise *(ES* =.22). Suggest link between exercise & global self-esteem has been over-stated (see also McAuley et al., 1997, 2000). Need to focus research on domain-specific. Effect sizes: physical acceptance .38, physical competence .32, physical self-worth .27, global self-esteem .22

Table 22. Summary: Review Current Physical Self-perception Instruments

Instrument	Development	Structure	Scoring	Comment
PSPP Physical Self-perception Profile Fox & Corbin, 1989 [PSPP-A Adult form adapted from PSPP by Chase, 1991}	Based on: • Harter, 1982 • Shavelson et al., 1976 • Marsh & Shavelson, 1985 1. Identified items using open-ended questions. 2. Sub-domains identified by factor analysis.	Four Sub-domains: • Bodily attractiveness • Sports competence • Physical strength • Physical condition Plus: Global physical self-worth 30 Items (6 per sub-domain)	Non-standard response: 1. For each item respondent selects one of two opposing statements, one negative and one positive e.g., "Some people feel that they are not very good when it comes to sports: others feel that they are good at just about every sport" 2. Then they respond to the chosen statement on a 1-4 Likert-style scale	Purpose: eliminate social desirability in responding Advantages: 1. Short, only 30 items, Likert-style response 2. Equally valid both sexes, stable at least over 3 wks, sensitive to a wide range of individual differences, psychometrically sound (Fox, 1990). Validated mid-age/ older adults (Sonstroem et al., 1992) Disadvantages: 1. Difficult to understand the 2-statement format 2. Sport and exercise should be differentiated 3. PSW and attractive body may overlap (Sonstroem et al.,1994)
PSC Physical Self-concept Richards, 1987	Based on: • Marsh & Shavelson, 1985	Physical factors: • Body build • Appearance • Health • Physical competence • Strength • Physical satisfaction 35 Items (5 per factor)	Standard response: 8-point true/false response scale Items are self-statements e.g., "I am physical co-coordinated" and "I dislike sports and physical activity"	Purpose: A brief, quick, easy to complete, reliable instrument Advantages: 1. Validated on all ages, both sexes (Richards, 1985) 2. Psychometrically sound (Marsh & Richards, 1994) Disadvantages: 1. Limited support for construct validity 2. Limited use in published papers to date
PSDQ Physical Self-description Questionnaire Marsh & Redmayne, 1994	Based on: • Shavelson et al., 1976 Scales comprise: (a) 5 components of physical fitness identified by Marsh's factor analysis of fitness indicators from Australian Health & Fitness survey (b) 6 components of physical self-concept	Eleven scales: • Strength • Body fat • Physical activity • Appearance • Endurance/fitness • Sports competence • Co-ordination • Health • Flexibility • Esteem • Global physical 70 Items (3-7 items per scale)	Standard response: 6-point true/false response scale false Mostly false More false than true More true than false Mostly true True Items are self-statements e.g., "I am attractive for my age", "Most sports are easy for me" and "My body is stiff and inflexible".	Purpose: a more comprehensive instrument Advantages: 1. Cross validated, comprehensive, psychometrically sound 2. According to Marsh (1994) compared to PSPP and PSC, the PSDQ is best for research 3. Cross-culturally validated Germany, Turkey(on students) Disadvantages: 1. Designed for adolescents but "Should be appropriate for adults" (Marsh & Richards, 1994) 2. Validated on high school adolescents aged 12-18 years 3. Cross-validated on high school and uni undergrads. 4. Sport and exercise should be differentiated
SPEQ Self-perception in Exercise Questionnaire Sorensen, 1999	Based on: • Shavelson et al., 1976 1. Items identified from the literature 2. 4 components of self-perceptions specific to exercise participation identified by factor analysis	Four scales: • Fitness • Body • Exercise mastery • Social comfort/ discomfort in the exercise situation 24 Items (4-8 items per scale)	Standard response: 4-point Likert-scale Agree Somewhat agree Somewhat disagree Disagree Items are self-statements e.g., "I prefer doing exercise alone", "I am fit", and "I think my body looks good".	Purpose: A scale which is exercise specific Advantages: 1. Short, only 24 items, Likert-style response 2. Psychometrically sound, all scales reliable, construct validity demonstrated with similar scale (Harter ASPP) 3. Exercise specific 3. Environment and the individual are considered Disadvantages: 1.Limited use in published papers to date 2. Only 4 fitness items