

The Relationship between Participation in an Exercise Program and Body Image in Post-
Menopausal Women Self-Reporting Osteoporosis

Karlene Willmott, BScK

Submitted in partial completion of the requirements for the degree of
Master of Arts in Applied Health Sciences
(Health and Physical Education)

Under the supervision of Kimberley L. Gammage, PhD

Faculty of Applied Health Sciences, Brock University
St. Catharines, Ontario

Karlene Willmott © February, 2011

ABSTRACT

The current study investigated body image differences in post-menopausal women who self-reported having (SRO) or not having (SRN) osteoporosis and the impact of a 16-week exercise program on body image in these groups. Participants completed a measure of body image, and were randomly assigned to a 16-week exercise program or control group, stratified by self-reported osteoporosis status. After 16 weeks, they completed the same body image measure. There were no differences in body image between the two osteoporosis groups. The exercise intervention had a positive impact on body image for both the SRO and SRN groups. The exercise groups showed increases in fitness and health orientation and body areas satisfaction from baseline to 16-weeks, while the non-exercise group showed decreases in appearance and health evaluation, health orientation and body areas satisfaction. The results suggest an exercise program for post-menopausal women can lead to improvements in body image, regardless of osteoporosis status.

ACKNOWLEDGEMENTS

You would think that after 4 plus years, I would know exactly just what to write here. I have certainly had enough time to think about it, however, as I reflect upon my Masters and thesis journey at Brock, it is difficult to find words that adequately express my sincerest appreciation and heartfelt gratitude to everyone who has helped me along the way. To my committee, Dr. Krista Chandler, Dr. Allan Adkin, Dr. Phil Sullivan, Dr. Brian Roy, and my advisor, Dr. Kim Gammage, I thank each of you for your contributions to my thesis. I appreciate each of your individual expertise, as well as your invested time and effort; thank-you for guiding and supporting me to be successful. Your questioning has made me think critically and has challenged me. This thesis adventure has prepared me for the future in so many ways for which I will always be thankful. More than anything, I have learned the value and importance of determination and perseverance when faced with a challenge. I have experienced the power of believing in myself, and the importance and strength that comes from having amazing people in my life. Lightweights, thank-you for the laughs, lessons, memories, and medals. Thank-you for making me happy it took so many seasons to finish this; fall 2011 will seem like it's missing something. Thanks for never letting me forget my age, you have made this experience unforgettable. I will miss being your driver. To the most wonderful family and friends, without you, I couldn't have done this, and wouldn't be where I am today. While you each deserve an individual thank-you, due to the space requirements here, I am going on the premise of 'you know who you are'. Thank-you for understanding 'thesising', for being patient, for making threats when necessary, for not following through with those threats, for loving me, and for supporting me no matter what. You are each a part of this and the significance it has in my life. Love you all. Longtime.

TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
CHAPTER ONE: LITERATURE REVIEW	1
1.1 Introduction to Body Image	1
1.1.1 Gender Impacts Body Image	5
1.1.2 Age Impacts Body Image.....	7
1.1.3 Health and Disease Status Impact Body Image	12
1.2 Introduction to Osteoporosis.....	14
1.2.1 The Prevalence and Costs of Osteoporosis.....	15
1.2.2 Financial Costs.....	15
1.2.3 Health Costs	15
1.2.4 Psychological Costs	16
1.3 The Risk Factors of Osteoporosis.....	16
1.4 Managing Osteoporosis	18
1.5 Osteoporosis and Body Image	19
1.6 Exercise and Body Image	22
1.7 Osteoporosis, Exercise and Body Image	26
CHAPTER TWO: RATIONALE, PURPOSE, & HYPOTHESES	27
2.1 Rationale	27
2.2 Purpose.....	29
2.2.1 Research Question #1	30
2.2.2 Research Question #2	30
2.3 Hypotheses	30

2.3.1	Research Question #1	30
2.3.2	Research Question #2	31
CHAPTER THREE: METHODOLOGY		32
3.1	Participants.....	32
3.2	Materials	33
3.2.1	Physical Activity Readiness Questionnaire (PAR-Q).....	33
3.2.2	Multidimensional Body-Self Relations Questionnaire	33
3.2.3	Health/Activity Questionnaire	37
3.2.4	Adherence	37
3.2.5	Anthropometric Measures.....	37
3.3	Procedures.....	38
3.4	The Exercise Program.....	39
3.4.1	Orientation Session	40
3.4.2	Exercise Program	41
3.4.3	Logbooks.....	43
CHAPTER FOUR: RESULTS		44
4.1	Data Analysis	44
4.1.1	Treatment of Missing Data	44
4.1.2	Reverse Coding and Subscale Score.....	44
4.1.3	Outliers.....	44
4.1.4	Normality of Sampling Distribution	45
4.1.5	Linearity	45
4.1.6	Homogeneity of Variance	46
4.1.7	Multicollinearity	46

4.2	Hypothesis Testing.....	46
4.2.1	Research Question #1	46
4.2.2	Research Question #2	47
	CHAPTER FIVE: DISCUSSION.....	48
5.1	Descriptive Data.....	48
5.2	Research Question #1	52
5.3	Research Question #2	56
5.4	Limitations	64
5.5	Future Directions	66
5.6	Implications.....	67
5.7	Conclusions.....	67
	REFERENCES	69
	Table 1	81
	Table 2	82
	Table 3	83
	Table 4	84
	Table 5	85
	Table 6	86
	Table 7	87
	Table 8	88
	Appendix A: Informed Consent.....	89
	Appendix B: Demographic Questionnaire, PAR-Q, MBSRQ.....	90
	Appendix C: Ethics Clearance	97
	Appendix D: Recruitment Poster	99

Appendix E: Participant Logbook Sheet.....100

CHAPTER 1: LITERATURE REVIEW

1.1 *Introduction to Body Image*

Body image is a multi-dimensional construct that involves the internal cognitive representations of the outer body (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). It includes an individual's perceptions, thoughts, attitudes, feelings, beliefs, and behaviours concerning his or her body (Cash & Henry, 1995). Body image is an integration of the physical, psychological, and social aspects of the self (Cash, 2004). It can develop both consciously and unconsciously, and can change over time. Many of these changes occur as a result of the aging process (Baker & Gringart, 2009); as individuals get older, a person's body, relationships and familial and societal roles change. Body image is an important concept in relation to health and well-being. Its multi-factorial structure is a direct indication of its complexity and depth.

The concept of body image was studied by Schilder (1950), who considered body image to consist of three components: 1) physiological structure, 2) libidinous structure, and 3) sociological structure. The physiological structure involves an active construction of the image of the body, the formations of one's perceptions of his or her body, and refers to a person's physical body in space. The libidinous structure refers to sexual desires, whereby changes can greatly influence one's perception of the body (Schilder, 1950). The sociological structure involves the relationship between one's body image and other people's body images. Schilder (1950) defined body image in terms of appearance - as the picture a person has of his or her body in his or her mind. While this represented a good starting point in the investigation of body image, it largely omitted the functional

component of a person's body and failed to address how that functionality influences a person's body image.

More recently, Bane and McAuley (1998) have defined body image in terms of four dimensions: perceptual, cognitive, affective, and behavioural. The perceptual dimension involves the mental picture that people have of their bodies, or how accurately individuals picture themselves with respect to body size and shape. This mental image is not necessarily indicative of the true appearance of the body in space; the perceptions that people hold about their bodies may actually be quite inaccurate and distorted. For instance, some individuals perceive themselves to be too large when they look in a mirror, while in fact they are normal to average build (Bane & McAuley, 1998). In general, women tend to overestimate their weight and body sizes (Whisenhunt & Williamson, 2002).

The cognitive dimension includes people's thoughts, beliefs, and attitudes towards their bodies. It is most often associated with how individuals evaluate their bodies based on appearance and function (Cash, 2005), but can also include the importance (or investment) placed on the body. For example, the cognitive dimension involves people's satisfaction or dissatisfaction (evaluation) with their body. In addition, personal assessments of attractiveness, strength, and fitness of the body as a whole and in its various parts are also involved in this dimension (Cash, 2005). It is important to distinguish between evaluation and investment in body image as they may have different outcomes (Cash, 2005). When body appearance, function and health status are considered, constructs of evaluation and investment or concern can interact in a variety of ways. For example, individuals could be satisfied with their bodies (positive evaluation),

yet may not place significant importance (high or low investment) on appearance, function and health. On the contrary, people could be very dissatisfied with their bodies, and not place significant importance on the appearance, function and health of the body. In either of these instances, the evaluation of the body may have little impact on the individual. However, a person could have a negative evaluation of the body, but highly value (high investment) the appearance, function and health of the body. In this case, it is possible that the combination of high importance and negative evaluation may lead to more negative outcomes. These positive and negative evaluations of the body and its functions as well as a person's investment in such evaluations may vary greatly between individuals and also within an individual over time.

The emotional or affective dimension of body image is characterized by the feelings experienced about the body's appearance and function. These feelings can be both positive and negative and include pride, confidence, shame, and anxiety. However, most often negative emotions are the focus of research (Cash, 2005). One of the most commonly studied body-related emotions is social physique anxiety (SPA). Evidence suggests that physique anxiety and related body image concerns impact women of all ages (McAuley, Bane, Rudolph, & Lox, 1995), including adolescents (Eklund & Bianco, 2000), middle-aged adults (McAuley et al., 1995) and older adults (Woodgate, Martin Ginis, & Sinden, 2007).

Lastly, the behavioural dimension involves the actions that individuals perform which are representative of the perceptions, thoughts and feelings they possess about their individual bodies. In their work with female college students, Rudd and Lennon (2000) reported that appearance-management behaviours were practiced in response to

gendered social norms; specifically, female beauty in the Western world is defined by thinness, fitness, and attractiveness (Rudd & Lennon, 2000). For example, wearing tight-fitting or figure-revealing clothing may be associated with a positive body image, while wearing baggy or loose-fitting clothing may be associated with a negative body image (Trautmann, Lokken Worthy, & Lokken, 2007). The avoidance of certain social situations in particular where one would be required to wear revealing clothing (such as going to the beach wearing a bathing suit or exercising), frequent mirror-checking, continually seeking the reassurance from others, and certain exercise and diet patterns are other examples of behaviours that can be associated with body image concerns (Prichard & Tiggemann, 2005). The behavioural dimension is highly reflective of the other three aspects of body image. Together these four dimensions coalesce to form one's body image, which as suggested above, can range from being extremely positive to extremely negative.

It is important to examine body image and its correlates, as a positive body image has been related to better psychological health and has been shown to be associated with higher levels of self-esteem and lower levels of depression and anxiety (Friedman, Reichmann, Costanzo, & Musante, 2002). Further, a negative image of the body has been found to be a predictor of a variety of health problems and disorders including depression, obesity, body dysmorphic disorder and eating disorders (Thompson et al., 1999). Negative body image can also lead to decreased physical activity levels and decreased self-efficacy (Cash, 2000).

Further, while it is important to consider appearance when discussing body image, it is also critical to examine other aspects of the body, such as appraisals of body fitness

and function. Much like the criticisms of the work of Schilder (1950), although appearance is arguably the most influential aspect of body image, it is not the only influence; body ability, capacity, function and health are also critically important in determining one's images of his/her body (Cash, 2004). In this case, fitness refers to the physical condition of a person's body and involves a sound and healthy body, while function refers to the optimal performance of the body and its systems which contribute to good health (Cash, 2004). It involves the successful performance, accomplishment, and execution of various tasks ranging in difficulty and complexity. Body fitness and function are closely related; a high fitness level is conducive to high levels of bodily function.

A person's body image is not necessarily static; it can evolve over time based on a variety of factors (Cash, 2004). These fluctuations are of interest to researchers with the intent to define and understand body image in terms of its patterns of change. There are a variety of factors that can impact body image, including demographic factors such as age, gender, exercise, health status, and nutrition. Although there are many factors that can potentially influence levels of body image, for the purposes of this review, the four primary factors which will be described are gender, age, health/disease status, which are all uncontrollable, and exercise participation, which is controllable.

1.1.1 *Gender Impacts Body Image.* A woman's body image is shaped and influenced primarily by what she perceives to be ideal (Monteath & McCabe, 1997). While both men and women have been found to be dissatisfied with their bodies, this dissatisfaction usually occurs for different reasons. Women tend to want to be thinner and reduce their body weight, while men tend to want to be heavier and increase their muscle

mass (Kaminski & Hayslip, 2006). These differences occur as a direct result of the ideals of Western culture and civilization; women should be very thin, toned and firm, while men should have broad muscular shoulders and arms, a narrow waist with toned abdominals, and muscular legs (Kaminski & Hayslip, 2006). For women, in addition to body physique, the expectations appear to be heightened and very narrowly defined. The 'Barbie-doll' appearance is idealized; society's ideal woman is young, tall and tanned, with blonde hair and blue eyes (Siegel, 2010). Unfortunately, these ideals represent an image that is simply unattainable for many women; it has been estimated that less than 1% of women could even reach this ideal structurally and physiologically (Thompson et al., 1999). Further, this unrealistic ideal is confirmed daily through many forms of media. This essentially unattainable goal leads to body dissatisfaction among many women (Siegel, 2010). It is a major concern that the media recognizes and upholds standards and goals that are very unrealistic and out of reach for the average person.

In general, women tend to be more dissatisfied with their bodies than men (Garner, 1997). In a 1997 survey of 3,400 women and 500 men ages 13 to 90 years of age, 56% of women and 40% of men reported that they were dissatisfied with their overall appearance, with those from 30-39 and 50-59 years old being the most dissatisfied (Garner, 1997). Women's dissatisfaction tends to be related to weight and shape, most specifically with the lower body. Females reported the highest levels of dissatisfaction with their abdominals and hips (Goldsberry, Shim, & Reich, 1996). This elevated body dissatisfaction in women is of concern as it may lead to other psychological problems such as anxiety, depression, and other mood disorders (Ackard, Croll, & Kearney-Cooke, 2002). In a study of college females, Ackard et al. (2002) found a positive relationship

between body dissatisfaction, depression, and feelings of ineffectiveness and insecurity (Ackard et al., 2002).

Constructs of femininity give great value to both physical attractiveness and youth, two ideals which women are moved farther away from as a result of the ageing process (Rudd & Lennon, 2000). It is important to recognize gender differences in body image, to understand the impact that they have on health, and to address and consider men and women individually.

1.1.2 *Age Impacts Body Image.* Body image is relevant for people of all ages. Body image concerns and specifically body dissatisfaction have been shown to exist among children as young as 6 and 7 years old (Ricciardelli & McCabe, 2001). However, the majority of the existing research on body image focuses on adolescents and young adults (Grogan, 1999), as body image concerns peak during adolescence and young adulthood due to a considerable focus on weight, body shape, and appearance. Therefore, deviations from what is considered attractive and appealing by society can lead to body image disturbances (Ricciardelli & McCabe, 2001). Although these groups have historically been the primary focus of body image research, the scope of body image and changes in body image extend much beyond this select group of individuals. Even in older age, body image concerns remain (Baker & Gringart, 2009).

Through adulthood, as the body ages, there are associated changes in body shape, size, proportion and ability, which have been found to greatly impact body image (Tiggemann, 2004). Many of these changes occur in mid to older adulthood. For example, physical appearance changes such as the wrinkling of the skin and the graying of hair have been shown to affect body image (Martin, Leary, & Rejeski, 2000). Further,

changes in body shape, weight, and weight distribution are experienced as a result of the aging process. Most apparently, a pattern of increased body mass is common and occurs among most individuals in conjunction with the process of aging. For instance, Garner (1997) reported that women tend to increase in body weight by between 5 and 10 pounds for every 10 years of life. Weight gain contributes greatly to changes in body image and perceptions of the self. In addition to increases in body weight, as women age they experience a widening of the hips, thighs, and buttocks which can cause them to feel dissatisfied with their bodies (Tiggemann, 2004). Although these changes are a normal part of the aging process, what is important to note is that they move women further away from the ideal.

In addition to appearance-related changes, the decrease in physical ability and function associated with the aging process can also impact body image and overall well-being. Netz, Wu, Becker, and Tenenbaum (2005) conducted a meta-analysis of 36 studies linking physical activity to well-being in older adults without clinical disorders. They concluded that physical activity had a positive impact on self-efficacy, and that improvements in cardiovascular status, strength, and functional capacity were associated with improvements in overall well-being (Netz et al., 2005). With aging, decreases in levels of fitness can contribute to a more negative body image (Furnham, Badmin, & Sneade, 2002). For example, decreased cardiovascular capacity, lower muscular strength, decreased flexibility and poorer balance are factors related to body function that can influence levels of body image.

Aside from physical changes that may change body image, the work of Janelli (1993) suggests that at a certain age, the standards by which one evaluates his/her body

may change. Based on the five body parts (eyes, hands, fingers, legs, body weight) that elderly women reported being most dissatisfied with, a shift from concern with appearance to function can be hypothesized (Janelli, 1993). This is further supported by the work of Reboussin et al. (2000), who reported two distinct components of satisfaction with one's body: satisfaction with body function and satisfaction with body appearance, and suggested that older adults value body function more highly than body appearance. Therefore, although evaluation of the body (i.e., satisfaction or dissatisfaction) may not change as an individual ages, investment may shift from appearance to function.

In general, there are two different hypotheses about the effects of age-related changes on body satisfaction: (1) that body image gets poorer or more negative as people age and move further away from the ideal (Lewis & Cachelin, 2001); and (2) that body image gets better or becomes more positive as people's expectations decrease and as mature adults become more accepting of their bodies (Tiggemann, 2004). Therefore, it can be argued that body satisfaction could become more positive or more negative as a person ages.

Throughout the aging process, people's evaluations of (or satisfaction with) their bodies are subject to change. In adulthood, factors such as health and function tend to play a relatively larger role in how people perceive their bodies (Reboussin et al., 2000). This is not to say that appearance no longer plays a role; however, the relative importance of appearance in comparison to body function decreases as people age. In a recent review, Tiggemann (2004) concluded that body dissatisfaction among women remains quite stable throughout adulthood, until women are elderly, when aging can become positive for women in terms of body image. This review also stated that the importance

of body shape, weight and appearance decreased as women aged (Tiggemann, 2004), thus highlighting the difference between the evaluation of the body (i.e., satisfaction vs dissatisfaction) and its actual importance. It is likely that as appearance-related factors decrease in importance with body image evaluation, other factors such as body function take on greater importance. Several studies support this conclusion.

Halliwell and Dittmar (2003) studied body image concerns by conducting in-depth interviews with 42 men and women who were 22 to 62 years old. They concluded that aging was perceived as negative and that in general, the aging process had many negative connotations associated with it. They reported that this is primarily due to decreased physical attractiveness and capability, as well as a decreased sense of social visibility and power (Halliwell & Dittmar, 2003). However, they also found that with age, the societal demands for attractiveness tend to lessen and some women were therefore more relaxed about their bodies as they aged (Halliwell & Dittmar, 2003). These results are in contrast with the results of Montepare (1996) who surveyed 265 women age 17-85 years old, using the Body Esteem Scale (Franzoi & Shields, 1984) and the Self-Esteem Scale (Rosenberg, 1965). Middle-aged women reported increased levels of physical and sexual attractiveness when compared to younger and older women (Montepare, 1996). These differences may be due to the fact that middle-aged women placed more significance on sexual attractiveness, and related it more closely to physical attractiveness than do younger and older women. In a recent study of middle-aged and older adult men ($n = 471$) with a mean age of 50.8 years and women ($n = 383$) with a mean age of 51.1 years, body function and body appearance were shown to independently impact body satisfaction (Reboussin et al., 2000). Body satisfaction was

measured using nine questions derived from part of a health-related quality of life questionnaire. Participants were asked “In the past 4 weeks, how satisfied have you been with...” The study found that body composition and cardiorespiratory fitness were directly related to body satisfaction but that body function was the factor most strongly related to body satisfaction and well-being (Reboussin et al., 2000). These results suggest that older adults may value body function more than they value body appearance.

Park and Gutches (2006) suggested that older adults have greater levels of cognitive stability and flexibility regarding the “self”, thus promoting a more stable body image. This is consistent with Klein and Klein (2000), who reported that as individuals age, the self-concept changes and actually becomes stronger and more stable. Thus, changes in the physical body may not have as large an effect on body image.

By contrast, some evidence suggests that body image may worsen as we age. Lewis and Cachelin (2001) studied differences in body image and drive for thinness in middle-aged (50-65 years old) and elderly women (66 years and older). The middle-aged group of women had a greater drive for thinness compared to the elderly women, while the elderly group reported higher levels of body dissatisfaction than middle-aged women (Lewis & Cachelin, 2001). Lewis and Cachelin (2000) speculated that these pressures towards thinness affected the two different age groups of older women similarly, and that the differences between the two groups of women seemed to be primarily motivational and behavioural. While both groups of women were equally dissatisfied with their bodies, the elderly women reported that they were less likely to do anything about it than were the middle-aged women (Lewis & Cachelin, 2001).

Therefore, the information and the research available concerning these body image changes and patterns in older adults is somewhat inconclusive. This may be partially explained by the inconsistencies in the way that researchers form and label age groups. Discrepancies between how participants' age is classified, and how groups are labelled in various studies make it difficult to draw conclusions across studies. The ideal for women tends to be beauty defined through youth, regardless of age, and although body dissatisfaction seems to remain stable through adulthood, appearance tends to become relatively less important while body competence and function become relatively more important. It is thought that with age, as appearance decreases in importance, the importance of body function actually increases. There are some problems, however, with age-related body image research. Issues arise with respect to how age groups are created and defined, as there are discrepancies between studies with what is considered middle-aged, elderly and older adults. There is a general lack of research in samples older than college-aged individuals, and body image changes across the adult lifespan require further investigation.

1.1.3 *Health and Disease Status Impact Body Image.* A third uncontrollable factor that can impact body image is health and disease status. In general, people value a body that is healthy and attractive, and tend to evaluate the body's function based on elements of capability, strength and agility. Due to the multi-factorial nature of body image, it is likely that a disruption in health can greatly alter levels of body image. There is minimal research focusing on the relationship between health/disease status and body image, although it is likely that many illnesses and diseases greatly impact one's image of the body. Much like the influence of age, many diseases may impact body image through

changes in the body's appearance, fitness or function. For example, disease populations as varied as cardiac patients with mitral valve prolapse (Williams Utz, Hammer, Whitmire, & Grass, 1990) and breast cancer patients (Baxter et al., 1996) have been shown to experience poorer body image related to their disease.

Different diseases affect body image differently, and to different extents, according to the nature and the severity of the disease. Any dysfunction or disease of the body will likely elicit a negative impact on one's image of their body. For instance, an individual living with the physical deformities and/or the paralysis following a stroke is likely to experience body image disturbances and feel dissatisfied with his/her body (Rubio & Deusen, 1995). Similarly, diseases resulting in visible changes to the body, such as a mastectomy following breast cancer (Schover, Yetman, & Tuason, 1995) or severe kyphosis with advanced stages of osteoporosis (Sediak & Doheny, 2000) may impact body image more strongly.

In addition, it is likely that illness and disease affect not just appearance-related aspects of body image, but also feelings and cognitions about fitness and function, for instance, body image was evaluated among a group of patients who had undergone reconstructive plastic surgery (Sarwer, Whitaker, Pertschuk, & Wadden, 1998). It was found that regardless of the reason for surgery (reconstructive or cosmetic) patients reported a similar dissatisfaction with their bodies before and after surgery; however, patients who had undergone surgery due to health and/or illness reasons perceived themselves as less healthy and less concerned with their appearance than cosmetic surgery patients (Sarwer et al., 1998).

However, it is not just physical changes associated with disease that may impact body image. It is likely that the specific characteristics of the disease, whether or not it is chronic in nature, as well as its treatment will also play a significant role when considering how body image levels are affected. For example, Schover et al. (1995) reported that cancer treatment affected women's body image. Specifically, the type of treatment of breast cancer is associated with body image (Pinto & Trunzo, 2004). When examining body image following various breast cancer treatments, Mock (1993) found that body image was significantly more positive among patients who had conservative surgery, than compared to patients who had either mastectomy or mastectomy with immediate reconstruction.

Similarly, the nature of a disease could have significant implications for its effects on a person's body image. Whether a disease is chronic versus acute, controllable versus uncontrollable, or has a sudden versus a gradual onset should be examined. Chronic, uncontrollable, and sudden-onset illnesses are likely to have a greater impact on body image (Blair et al., 1996). These characteristics suggest that one such disease that may impact body image is osteoporosis.

1.2 *Introduction to Osteoporosis*

Osteoporosis is a skeletal disease that is characterized by a deterioration of bone tissue, which is associated with a subsequent decrease in bone density or low bone mass (Papaioannou et al., 2010). It is identified when normally healthy bone becomes porous, weakened and therefore more susceptible to injury and fracture. Osteoporosis occurs when bone mass decreases to the point that the structural integrity of the skeleton can no

longer be maintained (Papaioannou et al., 2010). Osteoporosis should not be confused with osteoarthritis; whereas osteoporosis is a bone disease, osteoarthritis is a disease of the joints and surrounding tissues (Osteoporosis Canada, 2009).

1.2.1 *The Prevalence and Costs of Osteoporosis.* This disease affects approximately two million Canadians, one in four women and one in eight men over 50 years of age, and is most prevalent among women over 50 years of age (Papaioannou et al., 2010). The costs associated with osteoporosis will be discussed in terms of both financial and health or human significance.

1.2.2 *Financial Costs.* In Canada, the cost of treating osteoporosis and the fractures due to the disease is estimated to be \$1.3 billion each year (Osteoporosis Canada, 2009). These costs are primarily the result of long term, hospital and chronic care (Osteoporosis Canada, 2009). Considering the increasing proportion of older people in the population, it is predicted that in the future these costs will rise. In addition to these financial costs, there are also health and psychological costs.

1.2.3 *Health Costs.* One outcome of particular importance when considering the costs associated with osteoporosis is hip fractures. In 1993, there were approximately 25,000 hip fractures in Canada (Osteoporosis Canada, 2009), of which eighty percent were related to osteoporosis (Osteoporosis Canada, 2009). This number is significant as hip fractures result in death in up to 20 percent of cases, and disability in 50 percent of survivors (Osteoporosis Canada, 2009). For individuals suffering from osteoporosis, both an increased fear and risk of falling can lead to activity restrictions, and subsequently decrease the activities of daily living in which an individual engages. Further, disfigurement due to osteoporosis can result from physical changes to the body such as

decreased height and kyphosis (Papaioannou et al., 2010). An increased fear of falling, risk of falling, and risk of fractures due to falling in the early stages of osteoporosis can be related to changes in balance that may not yet show up as functional changes (Tinetti, 2003).

1.2.4 *Psychological Costs.* Individuals living with osteoporosis are subject to a greatly reduced quality of life as the disease can cause disfigurement, lowered self-esteem, reduction or loss of mobility, and decreased independence (Osteoporosis Canada, 2009). The reduced quality of life among individuals suffering from osteoporosis is similar to the decreases among individuals living with other chronic diseases such as arthritis, ischemic heart disease, chronic pulmonary disease, diabetes mellitus, and cancer (Pearlman & Uhlmann, 1988).

1.3 *The Risk Factors of Osteoporosis*

There are many risk factors associated with osteoporosis, including both non-modifiable and modifiable factors. One of the most pronounced non-modifiable risk factors is gender. When considering the incidence of the disease according to gender, it is important to note that osteoporosis is significantly more prevalent in women than in men; one in four women over the age of 50 have osteoporosis while one in eight men of the same age have the disease (Osteoporosis Canada, 2009). This difference is likely due to smaller frame size and bone size in women, as well as hormonal differences between men and women.

Age is a second non-modifiable risk factor related to osteoporosis; the risk for the disease increases as age increases. This is true for both men and women; however in women it is the decrease in estrogen following menopause that is related to the decreased bone density, while in males a decrease in testosterone has been found to have a lesser, but similar effect (Papaioannou et al., 2010). In women, estrogen is the major regulator of bone metabolism, while in men estrogen is critical in bone resorption and both estrogen and testosterone regulate bone formation (Falahati-Nini et al., 2000). Generally for women, the risk for osteoporosis increases around the ages of 50-55, coinciding with menopause.

A third non-modifiable risk factor is ethnicity. While osteoporosis affects people of all ethnic backgrounds, individuals of European or Asian decent have an increased risk of the disease (Pothiswala, Evans, & Chapman-Novakofski, 2006). Family history and frame-size are two additional non-modifiable risk factors that impact an individual; a family history of osteoporosis and small frame size are both related to an increased risk of development of the disease (Glauber, Vollmer, Nevitt, Ensrud, & Orwoll, 1995; Soroko, Barrett-Connor, Edelstein, & Kritiz-Silverstein, 1994).

Modifiable risk factors can be controlled by the individual. The most prevalent and important modifiable factors include exercise and nutritional habits and behaviours. Specifically, participation in weight-bearing, impact and resistance activity, as well as adequate consumption of calcium and vitamin D all reduce the risk of osteoporosis (Papaioannou et al., 2010). In addition, a history of eating disorders, estrogen deficiency,

alcohol consumption and smoking can also increase a person's risk for developing osteoporosis.

1.4 *Managing Osteoporosis*

Although it cannot be cured, osteoporosis is a disease that can be managed and controlled. First, there are several precautions that a person suffering from osteoporosis can take in order to minimize the risk of fracture and falls (Papaioannou et al., 2010). Improvements in balance and muscle strength will reduce the risk of falls, and fractures as a result of falls. Therefore, it is very important to develop and train an individual's balance in response to the disease. Further environmental changes can also be important to reduce fall risk. For example, changes to the home can be made, and risky behaviours and certain movements should be avoided to minimize falls and fall-related fractures. Eliminating clutter, electrical cords, furniture or other sharp-edged items in the normal walkways or pathways of the house, improving lighting, and having an increased awareness of raised doorways, slippery floors, steps, stairways and throw rugs can all help to minimize the risk of falling (Osteoporosis Canada, 2009).

There are also many lifestyle changes that an individual can make in order to minimize the impact of the disease on his or her life and ultimately decrease the risk of fracture. Drug therapy, diet and calcium and vitamin D supplementation are often used to counteract decreased bone density (Papaioannou et al., 2010). In addition, exercise can also be used as one method of managing osteoporosis; specifically weight bearing, moderate to high impact and resistance exercise can reduce bone loss, improve health and potentially reduce fall risk (Osteoporosis Canada, 2009).

In order to help manage osteoporosis, an effective exercise program should include a variety of components including resistance, aerobic, balance, core and flexibility training (Fletcher et al., 1996). Weight-bearing, resistance and impact-type activities can improve bone primarily through reductions in bone loss as opposed to increasing bone accretion (Stewart, Mason, & Kelemen, 1988). In addition to improving bone strength by reducing bone loss, resistance exercise also improves muscle strength, and helps to maintain basal metabolism and control weight gain (Stewart et al., 1988). The increase in muscle mass associated with strength activities can also reduce fall risk (Stewart et al., 1988). Aerobic activities such as swimming, walking, climbing stairs, jogging and biking develop aerobic fitness, flexibility, joint range of motion, and also promote weight control and maintenance (Fletcher et al., 1996). Further, core strengthening exercises can contribute to improvements in posture, balance and stability (Fletcher et al., 1996). For those with osteoporosis, it is recommended that certain movements be avoided; forward bending, twisting at the waist, heavy lifting from the ground and high-intensity weight bearing exercise should all be avoided.

1.5 *Osteoporosis and Body Image*

Several characteristics of osteoporosis have the potential to decrease body image. Specifically, its chronic, relatively uncontrollable nature, as well as its onset and the possibility that it could lead to visible and functional changes, may lead to changes in body image (Sediak & Doheny, 2000). Osteoporosis is a disease that is chronic in nature and has a gradual onset; it has its roots in childhood and adolescence. Failure to achieve peak bone mass will increase the likelihood of developing osteoporosis later in life. Due to its chronic nature, individuals with osteoporosis will live their entire lives from the

point of diagnosis knowing that they have the disease (Sediak & Doheny, 2000).

Knowing that these changes are permanent and that these changes will often continue to worsen may certainly affect perceptions of the health or illness of the body. Further, although the onset of osteoporosis is gradual, for most women the diagnosis will be sudden because it is not until they experience a fracture that they learn they have osteoporosis (Turner, Faile, & Tomlinson, 1999). Thus, a diagnosis may be a surprise for many women, and can suddenly change how people see their bodies. Visible changes to the body, as well as behavioural and functional life changes stemming from the contraindications associated with the disease, may impact body image. Several of the outcomes of osteoporosis may be directly related to one's image of the body.

In its more severe forms, osteoporosis is associated with visible deformities such as decreased height, hunched posture, severe kyphosis, curvature of the spine, and protruding abdomen (Sediak & Doheny, 2000). These changes could all impact body image negatively, as they move women away from the ideal. Body appearance changes are most significant when a person looks in a mirror, experiences difficulty with finding clothing that fits appropriately and notices changes to his/her body such as a hunched posture or protruding abdomen (Sediak & Doheny, 2000). Women who suffer from osteoporosis face the challenges posed by an altered body, and therefore an altered body image. The visible deformities, functional limitations and associated health risks of the disease, make osteoporosis a disease with direct implications to a person's body image.

These changes not only directly impact the way a person perceives the physical appearance of his/her body, but also influence one's perceived functional ability of his/her body. This could subsequently impact the activities of daily living (ADL) in

which a person suffering from osteoporosis will engage. Individuals with osteoporosis may engage in less physical activity due to pain and discomfort, as well as insecurities of one's physical appearance or fear of injury. An individual's body image may be greatly altered when he/she experiences decreases in functional capacity and does not perform ADLs as competently as in the past. These changes may also lead to decreased body function and changes in behaviour. In addition, the contraindications to exercise and physical limitations associated with the disease may potentially impact an individual's body image. Upon diagnosis, individuals are advised to avoid certain movements such as unsupported forward flexion (e.g., sweeping, bending to pick an object up off of the ground). These limits to activities and changes to the activities in which a person suffering from osteoporosis can safely engage may also decrease an individual's sense of fitness and body function.

This decrease in body function could directly influence a person's perception of his/her body and warrants further investigation. Sediak and Doheny (2000) suggested that the relationship between osteoporosis and body image was a major issue to be addressed; body image may be directly impacted by osteoporosis but this relationship has yet to be explicitly examined. It is likely a relationship that is greatly influenced by the status of the disease. The severity and the progression of osteoporosis and its symptoms, both visible and perceived, could affect a person's image of his or her body.

1.6 *Exercise and Body Image*

Although age, gender and health status are important factors in understanding body image, they are all uncontrollable; however, one factor that can be changed or manipulated to positively impact body image is exercise participation. An extensive amount of research has focused on the impact of exercise on body image; however there is a large amount of variation and inconsistency between these studies, making it difficult to draw conclusions from them. Three meta-analyses (Campbell & Hausenblas, 2009; Hausenblas & Fallon, 2006; Reel et al., 2007) have attempted to provide a comprehensive overview of the relationship between exercise and body image. The first, by Hausenblas and Fallon (2006), was a meta-analysis of over 121 studies that showed an overall positive impact of exercise on body image. For the purposes of their analysis, studies were classified into one of three types: intervention, single group or correlational types of studies. Intervention-type studies included studies in which exercise and non-exercise groups were compared following an exercise intervention. Single group studies compared pre-exercise intervention and post-exercise intervention body image scores within a single group, and correlational studies included those studies in which the body image scores of exercisers were compared with those of non-exercisers. In general, they reported three primary findings: (1) that exercisers had a more positive body image than non-exercisers; (2) that individuals who participated in an exercise intervention reported a more positive body image following the intervention when compared to non-exercising 'control' individuals; and (3) that exercisers showed significant improvements in body image following an exercise intervention (Hausenblas & Fallon, 2006).

The second meta-analysis (Reel et al., 2007) considered 35 studies with exercise programs that influenced body concerns. These results were generally in agreement with the results of Hausenblas and Fallon (2006) as they reported that exercise positively affects body concerns. Most recently, Campbell and Hausenblas (2009) examined 57 experimental studies to investigate the effects of exercise on body image. They found that compared to control conditions, exercise improved body image. From these three analyses, we can conclude that in general, exercise has a positive impact on body image. There are however, various modifying factors that influence this relationship. The most influential of these modifying factors are gender, age and exercise characteristics such as mode, intensity, and supervision (Hausenblas & Fallon, 2006).

These modifiers of the exercise-body image relationship were assessed and analyzed in each of the meta-analyses (Campbell & Hausenblas, 2009; Hausenblas & Fallon, 2006; Reel et al., 2007). When the intervention-type studies or the experimental vs. control group type studies were considered, these modifiers were found to vary in their effect size and influence on the exercise-body image relationship.

With respect to gender, generally no differences exist between males and females in the effects of exercise on body concerns (Campbell & Hausenblas, 2009; Reel et al., 2007). Overall, women are more concerned with losing body fat, while men are more concerned with the development of muscle tone (Reel et al., 2007). Regarding age, Hausenblas and Fallon (2006) reported that exercise had a significantly greater effect on body image for adolescents compared to university students and adults. It is important to note however, that older adults were not considered in this analysis as there was only one study that investigated this population. They concluded that although age may play a

factor in the relationship between exercise and body image, its influence on this relationship in older adults was inconclusive. However, Campbell and Hausenblas (2009) investigated the effects of exercise on body image in four age groups: youth, university, adults and older adults 50 years and older. They found the largest effect sizes for adults ($ES=.44$) and older adults ($ES=.33$).

With respect to the characteristics of the exercise itself, Hausenblas and Fallon (2009) found a significantly larger effect for people participating in both aerobic and anaerobic activity, compared to people who were participating in either of the two types of exercise independently. By contrast, weight-training and anaerobic exercises were found to have a stronger effect than jogging and other aerobic-type activities (Reel et al., 2007). More recently, Campbell and Hausenblas (2009) found mode of exercise made no difference, with all types of exercise studied (i.e., aerobic, resistance training, or both) leading to improvements in body image. Similarly, no moderating effect of duration, frequency or length of intervention has generally been reported (Campbell & Hausenblas, 2009; Hausenblas & Fallon, 2006). For exercise intensity, the smallest effect was reported for mild exercise, followed by moderate exercise, while strenuous exercise was found to have the greatest effect on the relationship. With respect to exercise frequency, the higher the frequency the greater the positive impact on body image (Campbell & Hausenblas, 2009). Finally, the type or degree of supervision of the exercise program or bout was also found to have significant influences. Programs were classified as self-guided, mixed, or supervised; a program was considered mixed if participants were given instructions and were then left alone to complete the exercise. It was reported that the

mixed-supervising formats had the greatest effect on body image, followed by the self-guided groups, while the supervised groups had the smallest impact (Reel et al., 2007).

There is clearly a complex network of modifying factors that act to influence the relationship between exercise and body image. Although the significance of these modifying factors has been shown among adolescents and young adults, the role that these factors play and their importance among the aging population remains understudied. Schuler et al. (2004) were interested in older people's motives to exercise and body image. They studied perceptions of body shape and motivations to exercise in older adults between 50 and 98 years of age. Their results showed that these older individuals had a desire to be thinner regardless of their age or exercise participation. They also reported that dissatisfaction with body shape did not motivate these participants to exercise; they were motivated by their desire to achieve good health and physical fitness (Schuler et al., 2004).

Lanning, Bowden, Owens, and Massey-Stokes (2004) conducted a study with adults over the age of 60, and assessed these participants' self-reported physical activity levels, perceived fitness levels, and SPA. SPA is the anxiety that people experience during situations in which their bodies are being examined or evaluated by others and is considered to be part of the affective dimension of body image (McAuley, Marquez, Jerome, Blissmer, & Katula, 2002). They found that these older adults reported fitness levels ranging from 'average' to 'above average' and that neither perceived fitness nor age had a significant effect on participants' SPA. McAuley et al. (2002) found that improvements in self-efficacy and fitness were significant predictors of changes in SPA, but that changes in body fat and exercise frequency did not contribute to changes in SPA.

Since SPA represents the affective dimension of body image, it is likely that some of the observed differences in results of studies of SPA may be similar to the differences in other dimensions of body image (e.g., perceptual, behavioural).

1.7 *Osteoporosis, Exercise and Body Image*

Body image may be a significant issue for many women suffering from osteoporosis, perhaps because of the physical and functional changes to the body experienced as a result of the disease. These changes can have implications on an individual's health, fitness, and overall well-being and function in life. Exercise may be one way to improve some of the negative physical and functional decreases experienced as a result of osteoporosis. A well-developed exercise program will improve physical appearance, functional capacity and a person's ability to complete ADL, and could lead to improvements in one's body image. It will not only lead to changes associated directly with the disease (i.e., reduce risk of falls, fall-related fractures), but may also improve a person's overall body image. However, the effectiveness of an exercise program on improving body image has not been investigated among women with osteoporosis. It is of interest to investigate the effects on body image when an exercise program designed specifically for this population is completed.

CHAPTER 2: RATIONALE, PURPOSE, & HYPOTHESES

2.1 *Rationale*

The multidimensional construct of body image represents one's inner representation of his or her outer self (Thompson et al., 1999). Body image comprises a person's perceptions, attitudes, beliefs and behaviours about his or her body (Lox, Martin Ginis, & Petruzzello, 2006). It is important to assess both the evaluation of (i.e., satisfaction or dissatisfaction), and the importance of or the investment in (i.e., high or low) one's body image (White, 2002). Particularly for older adults, although women's dissatisfaction may not change over the lifespan, the relative importance placed on appearance, health and functioning may change (Tiggemann, 2004).

Body image is an extremely important aspect of health, as it has both physiological and psychological implications. For example, a negative image of the body has been related to many negative health outcomes including anxiety, depression, poor self-esteem and physical inactivity (Miller & Downey, 1999). A person's body image can be affected by a variety of factors including gender, age, physical activity behaviours and physical changes to the body itself. Physical changes to the body can occur as a normal result of the aging process, or can also occur as a result of illness or disease. One such disease that may affect body image is osteoporosis.

Osteoporosis is a musculoskeletal disease that involves a decrease in bone density (Turner et al., 1999). It results in a significant deterioration of bone to a level below that which is necessary to maintain the structural integrity of the skeleton. Osteoporosis can also lead to physical changes in the body itself such as loss of height, curvature of the spine, back pain and poor posture (National Institutes of Health Osteoporosis and Related

Bone Diseases National Resource Center, 2000). These physical changes have the capacity to negatively influence one's body image.

Osteoporosis is a prevalent disease; it affects approximately two million Canadians, and although the disease can affect individuals at a variety of ages, it is primarily post-menopausal women who suffer from the disease (Osteoporosis Canada, 2009). In Canada, the financial costs of osteoporosis and the fractures it causes are estimated to be \$1.3 billion each year (Osteoporosis Canada, 2009). These costs are primarily incurred as a result of long term, hospital and chronic care. In the future, it is likely that these costs will rise due to the increasing proportion of elderly people in the population.

In addition to the risk of falls and fractures, another health-related concern that may potentially exist in women with osteoporosis is body image. Although osteoporosis may have a strong negative impact on body image, no research to date has directly investigated this relationship. Sediak and Doheny (2000) suggested that body image was a major concern for women suffering from osteoporosis. In fact, they recommended that the appearance changes occurring as a result of osteoporosis be examined by medical practitioners (Sediak & Doheny, 2000). Therefore, it is important to investigate the impact that osteoporosis has on body image.

One potential intervention that may positively impact both body image and osteoporosis is exercise. Exercise, particularly weight-bearing, resistance, and impact activity, have been shown to have a positive impact in those with osteoporosis, as it can help reduce bone loss and improve bone health, improve muscle strength, coordination, flexibility and reduce the risk of falls by improving balance (Chan, Anderson, & Lau,

2003). These improvements can therefore lead to significant improvements in overall health (Chan et al., 2003). In terms of body image, exercise has consistently been found to have a positive impact, across age and gender (Campbell & Hausenblas, 2009; Hausenblas & Fallon, 2009). However, to date, no research has examined whether exercise is an effective intervention for improving body image in those with osteoporosis. Further investigation of the relationship between exercise and body image in women suffering from osteoporosis is warranted.

If exercise is found to positively impact body image among women suffering from osteoporosis, there are several potential implications. First, practitioners will be able to better design treatment and rehabilitation programs for individuals suffering from osteoporosis. Second, a person's body image could be monitored and used as a measurement of improvement and overall satisfaction with one's quality of life. Therefore, there is a need to investigate this relationship further - to examine body image in those with osteoporosis, and to determine the effect of an exercise program that considers body image for women with osteoporosis.

2.2 *Purpose*

The overall purpose of the current study was to examine body image in post-menopausal women with osteoporosis, and the impact of an exercise program on body image in this group. Two primary research questions were the focus of the current investigation.

2.2.1 *Research Question #1.* Do differences in body image exist between women who self-report that they have osteoporosis and women who self-report that they do not have the disease?

2.2.2 *Research Question #2.* When exercisers and non-exercisers are compared, does participation in a 16-week exercise intervention positively impact body image, and is this impact greater in post-menopausal women who self-report that they have osteoporosis compared to women who self-report that they do not have the disease?

2.3 *Hypotheses*

There were two main hypotheses for the current study.

2.3.1. *Research Question #1.* Because body image is generally poorer in individuals with a chronic disease (Turner et al., 1999), it was hypothesized that at baseline, women who self-reported that they have osteoporosis would have a poorer overall body image than women who self-reported that they do not have the disease. Specifically, it was hypothesized that women who self-reported that they have osteoporosis would score lower than women who self-reported that they do not have osteoporosis on each dimension (Appearance Evaluation, Appearance Orientation, Fitness Evaluation, Fitness Orientation, Health Evaluation, Health Orientation, Illness Orientation, Body Areas Satisfaction Scale, Overweight Preoccupation and Self-Classified Weight) of the MBSRQ. Given osteoporosis is a chronic disease, it was also hypothesized that women who self-report having osteoporosis would score lowest on subscales related to health/illness and fitness rather than appearance, although it was expected that appearance would also be negatively affected.

2.3.2. *Research Question #2.* Following the 16-week exercise intervention, it was hypothesized that all women (whether they self-reported as having osteoporosis or not), in the exercise group would show improvements in body image, as reflected by increased scores on the measure of body image. However, it was also hypothesized that within those who exercised, a greater improvement would be observed in the women who self-reported that they have osteoporosis compared to those who self-reported that they do not have osteoporosis. In addition, it was expected that both the self-report osteoporosis and the self-report non-osteoporosis control groups would show no changes in body image from the baseline to the 16-week tests.

CHAPTER 3: METHODOLOGY

3.1 *Participants*

This investigation is part of a larger study that was completed at Brock University from September 2006 to December 2007 investigating the effects of an exercise program on balance and body image in post-menopausal women with osteoporosis. Two groups of participants were drawn from the data: 27 post-menopausal women who self-reported having osteoporosis (SRO) and 41 post-menopausal women who self-reported not having osteoporosis (SRN). Participants were between 55 and 70 years old. Inclusion criteria were that women were a minimum of 55 years old, post-menopausal, non-smokers, with no contra-indication to exercise, and were not taking any hormone replacement therapy (HRT). Exclusion criteria included being diagnosed with conditions that relate to osteoporosis or affect the ability to safely perform the physical activity or tests (e.g., rheumatoid arthritis, neuromuscular disease, balance disorders, fractures less than 8 weeks prior to program start), HRT, and any previous balance training (although they could have participated in other forms of physical activity). Also, for participation in the exercise group, those who did not attend at least 80% of their possible exercise sessions were excluded from analysis. Thirteen women did not complete the 16-week tests, and were therefore excluded from data analysis for research question 2. For the purposes of the second research question, four groups were formed: SRO Exercise (EX); (n = 12), SRO Non-Exercise (NEX); (n = 10), SRN EX (n = 17), and SRN NEX (n = 16). Basic descriptors of the sample by group are shown in Table 1. A series of ANOVAs were run to insure that the groups did not differ based on the demographic information, and no significant differences were found (all p 's > .05).

3.2 *Materials*

After completing informed consent (Appendix A), participants provided self-reported demographic information including age and health/medical history. They also completed a series of questionnaires (See Appendix B for all questionnaires).

3.2.1 *Physical Activity Readiness Questionnaire (PAR-Q)*. The PAR-Q (Canadian Society for Exercise Physiology, 2002) contains seven questions about health status, to which participants answer “yes” or “no”. The PAR-Q was used for physical activity clearance. Participants who answered “no” to all questions were able to participate in the exercise program. Those who answered “yes” to any of the seven questions were not given physical activity clearance to participate in the exercise program and were excluded from further study.

3.2.2 *Multidimensional Body-Self Relations Questionnaire (MBSRQ)*. The MBSRQ (Cash, 2000) was used to assess body image over the course of the study. It assesses both evaluation of (i.e., satisfaction/dissatisfaction) and orientation or investment in (i.e., importance) aspects of the body including appearance, fitness and health. The 69-item MBSRQ includes the following subscales: Appearance Evaluation (7 items), Appearance Orientation (12 items), Fitness Evaluation (3 items), Fitness Orientation (13 items), Health Evaluation (6 items), Health Orientation (8 items), Illness Orientation (5 items), Body Areas Satisfaction Scale (9 items), Overweight Preoccupation (4 items), and Self-Classified Weight (2 items). Each item is measured on a 5-point scale where 1= *more negative* and 5= *more positive body image*.

Appearance Evaluation (AE) is associated with feelings of physical attractiveness or unattractiveness. It deals with satisfaction or dissatisfaction with one's looks. High scorers feel mostly positive and satisfied with their appearance, while low scorers have a general unhappiness with their physical appearance (Cash, 2000). For example, one AE item asks individuals to rate their level of agreement with the statement "I like my looks just the way they are". The Cronbach's alpha for AE was 0.88 for pre and 0.87 for post.

Appearance Orientation (AO) is the extent of one's investment in or importance of his or her appearance. High scorers place more importance on how they look, pay attention to their appearance, and engage in extensive grooming behaviors, while low scorers are unconcerned with their appearance, report that their looks are not particularly important to them and do not expend much effort to "look good" (Cash, 2000). For example, one item related to AO asks individuals to indicate how strongly they agree or disagree with the statement "Before going out in public, I always notice how I look". The Cronbach's alpha for AO was 0.74 for pre and 0.83 for post.

Fitness Evaluation (FE) involves feelings of being physically fit or unfit. High scorers regard themselves as physically fit, or athletically active and competent, while low scorers feel physically unfit, or athletically unskilled. For example, one item related to FE asks individuals to rate whether they agree or disagree with the statement "I easily learn physical skills". The Cronbach's alpha for FE was 0.65 for pre and 0.78 for post.

Fitness Orientation (FO) is the extent of one's investment in being physically fit or athletically competent (Cash, 2000). High scorers value fitness and engage in activities to enhance or maintain fitness, while low scorers do not value physical fitness and do not regularly engage in exercise activities (Cash, 2000). For example, one item related to FO

asks individuals to indicate whether they agree or disagree with the statement “I would pass most physical-fitness tests”. The Cronbach’s alpha for FO was 0.78 for pre and 0.80 for post.

Health Evaluation (HE) is associated with feelings of physical health and/or the freedom from physical illness (Cash, 2000). High scorers feel their bodies are in good health, while low scorers feel unhealthy and experience symptoms of illness or vulnerability to illness (Cash, 2000). For example, one item related to HE asks individuals to indicate their level of agreement with the statement “I am in control of my health”. The Cronbach’s alpha for HE was 0.66 for pre and 0.76 for post. Health Orientation (HO) is the extent of one’s investment in a physically healthy lifestyle (Cash, 2000). High scorers are "health conscious" and try to lead a healthy lifestyle, while low scorers are more apathetic about their health (Cash, 2000). For example, one item related to HO asks individuals to rate whether they agree or disagree with the statement “I know a lot about things that affect my physical health”. The Cronbach’s alpha for HO was 0.78 for pre and 0.70 for post.

Illness orientation (IO) involves an individual’s reactivity to being or becoming ill (Cash, 2000). High scorers are alert to personal symptoms of physical illness and are apt to seek medical attention, while low scorers are not alert or reactive to the physical symptoms of illness (Cash, 2000). For example, one item related to IO asks individuals to report whether they agree or disagree with the statement “I pay close attention to my body for any signs of illness”. The Cronbach’s alpha for IO was 0.68 for pre and 0.80 for post.

The MBSRQ also has three additional subscales. The Body Areas Satisfaction Scale (BASS) is similar to the Appearance Evaluation subscale, except that the BASS assesses satisfaction with discrete aspects of one's appearance (e.g., specific body parts such as face, hair, lower torso, mid torso, upper torso, muscle tone, height, weight, and overall appearance or body qualities such as attractiveness). High scorers are generally content with most areas of their body, while low scorers are unhappy with the size or appearance of several areas (Cash, 2000). For example, one item related to the BASS asks individuals to rate how dissatisfied or how satisfied they are with their lower torso (buttocks, hips, thighs, legs). The Cronbach's alpha for BASS was 0.81 for pre and 0.82 for post. The Overweight Preoccupation (OP) subscale assesses fat anxiety, weight vigilance, dieting, and eating restraint. For example, one sample item from the OP construct asks individuals to indicate whether they agree or disagree with the statement "I constantly worry about being or becoming fat". The Cronbach's alpha for OP was 0.630 for pre and 0.654 for post. Finally, the Self-Classified Weight (SCW) subscale reflects how one perceives and labels one's weight, from very underweight to very overweight. For example, one item from this subscale asks individuals to indicate if they think they are "Very Underweight, Somewhat Underweight, Normal Weight, Somewhat Overweight, or Very Overweight".

The MBSRQ has been used with a variety of populations differing in gender, age and health status. It has been used with most age groups; Cash and Henry (1995) used the MBSRQ with women 18 – 70 years of age. The MBSRQ has also been used with more specific groups of individuals. For instance, the MBSRQ has been used with post-menopausal women (Deeks & McCabe, 2001) and with women suffering from breast

cancer (Parker et al., 2007). Internal consistency reliabilities for studies with older women have ranged from .73 to .90 (Cash, 2000), with test-retest reliability over 4 weeks ranging from .74 to .94 (Cash, 2000). Rusticus and Hubley (2006) found some evidence of invariance across age and gender and cautioned against using some subscales to make body image comparisons between genders or different age groups due to poor scalar invariance.

3.2.3 *Health/Activity Questionnaire.* The Health/Activity Questionnaire, taken from *The Fallproof Program* (Rose, 2003) was used to assess physical activity performed during one's leisure time or physical activity that was not related to occupational demands. Participants were asked to answer "yes" or "no" to the following question: "Do you currently participate in regular physical exercise (such as walking, sports, exercise classes, housework, or yard work) that is strenuous enough to cause a noticeable increase in breathing, heart rate, or perspiration?" If participants answered yes, they were asked to indicate how many days per week by circling a number from 1 to 7. This question was used to evaluate participants' physical activity levels at the onset and also at the conclusion of the study.

3.2.4 *Adherence.* Adherence was monitored and evaluated based on the number of visits that each participant achieved during the 16-week exercise intervention. Using individual participant's logbooks, adherence rates were calculated based on the actual number of visits made of a total possible 48 visits (3 visits per week for 16 weeks).

3.2.5 *Anthropometric Measures.* Height was measured (in cm) manually by a research assistant using a standard metric tape. Weight was measured (in kg) using a standard foot-step scale.

3.3 *Procedures*

The proposed project is part of a larger study that examined group differences between older SRO and SRN women in muscle strength, joint range of motion, balance control, balance confidence, body image, anthropometric characteristics, activity levels, fall incidence, and quality of life. The current thesis focuses on the body image component of the aforementioned multi-disciplinary study. Institutional ethics clearance was obtained (See Appendix C). Participants were recruited through posters (Appendix D) placed at Brock University and at Community Centres in the Niagara Region. Interested individuals contacted the research team, and were screened to ensure they met study requirements. Post-menopausal status was confirmed during the initial screening phone call. Individuals who met inclusion criteria were invited to the university for an initial testing session. At their first session, participants completed baseline questionnaires and anthropometric testing. Anthropometric tests included measurements of height, weight and body composition. Participants were then randomly assigned to one of two groups, EX or NEX, stratified by OP status. The EX group was asked to exercise 3 times per week for 16 consecutive weeks and was asked to not make any other changes to their lifestyle. Participants in the NEX (control) group were instructed not to make any changes to their exercise or other lifestyle behaviours throughout the 16-week duration of the study. Upon completion of the 16-week period, both EX and NEX participants were asked to complete the same set of questionnaires and anthropometric measures as during baseline. Upon completion of the study, NEX participants were offered the opportunity to

participate in the exercise program free of charge for 16 weeks. During this time, no data were collected; this was offered as a courtesy to participants.

3.4 *The Exercise Program*

The exercise facility was located in the Exercise Intervention Laboratory in the basement of Welch Hall at Brock University in St. Catharines, Ontario. The exercise laboratory had all basic cardiovascular, strength, balance and flexibility training equipment including treadmills, elliptical machines, stationary bicycles, weight-lifting machines, exercise balls, exercise bands, BOSUs and balance pods. The exercise facility was only open to study participants; there was at no time anyone other than individuals directly involved in the study present in the exercise lab. The exercise facility was open Mondays, Wednesdays and Fridays from 8:00am – 11:30am and from 5:00pm – 6:30pm. It was open Tuesdays, Thursdays and Saturdays from 8:00am – 9:30am. The exercise facility was closed Sundays. Participants were able to come anytime during the hours that the exercise facility was open. Student research assistants supervised and monitored participant progress throughout the duration of the study. There were a minimum of two research assistants present in the exercise lab at all times when the exercise lab was open. Student research assistants provided initial instruction on how to perform all exercises and use all equipment correctly and ensured participant safety and comfort during each exercise session. They monitored participant progress and made appropriate modifications to exercise based on improvement or individual needs. In addition, they were present to supervise and spot participants as they navigated through the balance component of the program.

Participants in the exercise group were asked to attend three exercise sessions per week for 16 weeks. Each exercise session was approximately an hour to an hour and fifteen minutes in duration, and was structured to include cardiovascular, strength, balance, and flexibility activities. All participants participated in the entire exercise program; however, it was designed and structured for women living with osteoporosis. Both exercise groups (SRO EX, SRN EX) completed exercises targeting the same muscles and muscle groups throughout the duration of the 16-week program. All participants used stationary weight machines at the onset of the program, and advanced to more independent forms (e.g., free weights, exercise bands) of weight-lifting as they progressed, to challenge balance and provide more functional exercises. The balance component of the program was a unique element of the exercise intervention. The balance training course, or balance ‘obstacle course’ was dynamic in nature and was changed and modified by the student research assistants frequently throughout the 16 weeks. It consisted of a variety of pieces of equipment challenging balance, such as wobble boards, rocker boards, balance pods, foam rollers, and BOSU balance balls.

3.4.1 *Orientation Session.* Upon completion of the initial screening and random group assignment, participants in the EX group were given an orientation to the exercise facility and program. During this orientation, proper settings for all machines were set and initial weights/intensity levels were determined where appropriate. Participants were taught how to complete each exercise properly, which muscle/muscle group was targeted by each exercise, and were given time to practice each exercise under the supervision of a student research assistant. Each participant was assisted with each exercise until she could consistently maintain proper form and technique.

3.4.2 *Exercise Program.* The cardiovascular component of the program required participants to complete 20-30 minutes of cardiovascular exercise using a treadmill (weight bearing), bicycle or elliptical machine (non-weight bearing). Participants recorded the intensity and duration of cardiovascular exercise completed during each session in their logbooks (see below for description). Participants were offered the flexibility to choose which activity or activities they preferred, although they were encouraged to select at least part of their cardiovascular activity on the treadmill, as it is a weight bearing, impact activity.

The strength component of the program included a series of strength training exercises that were selected to minimize the risk of injury for OP participants. This included avoiding unsupported forward flexion and exercises that involve bending at the waist, high-impact activities and twisting or rotating the spine combined with flexion at the waist. The initial exercises designed to increase strength included the seated row, seated chest press, seated leg press, seated calf raise, triceps press down, bicep curl, lateral arm raise and a wall squat with ball. The sequence in which these exercises were completed was at the discretion of each participant. Machines were used where possible to facilitate proper form and technique. Participants were instructed to complete one set of 12 to 15 repetitions for each exercise. When participants could successfully complete one set of 15 repetitions, the weight or the difficulty of that specific exercise was increased. Student research assistants were present to assist participants in maintaining proper form and technique, and were instructed to correct improper exercise form and technique. They were also responsible for increasing the difficulty of the exercises when appropriate.

The balance and core strengthening aspect of the exercise program was designed to improve participants' balance and balance confidence, to improve stability and to decrease the risk of falls. Activities for core strength included a seated isometric contraction (abdominals), a slow seated upright twist (obliques), opposite arm/leg raise (low back), roll (side-to-side) and pitch (front-to-back) leans (stability) and balance pod walking. The balance obstacle course was dynamic; it was modified and rearranged weekly by student research assistants. The course was made up of steps, balance boards, balance discs, balance pods, BOSU balls as well as various foam rollers and mats. Student research assistants challenged participants by adding physical and cognitive tasks to be performed during the navigation of the balance course itself. Examples of physical tasks included walking the course backwards, sideways, with eyes closed, with arms/hands overhead and carrying various objects. Some examples of cognitive tasks included asking participants to count backwards from 100 by 3's and naming various places (i.e., cities, countries) or objects (i.e., flowers, ice cream flavours) that start with each letter of the alphabet.

Flexibility was the fourth and final component to the exercise program. To increase flexibility and improve range of motion around various joints, participants were instructed to complete two sets of stretches each lasting between 20 and 30 seconds for each of the following muscle groups: biceps, triceps, shoulders, back, chest, gluts, quadriceps, calves, hip flexors, hamstrings and low back. There were pictures of a variety of possible stretches posted on the walls for participants to use as a guide as they stretch. Participants were encouraged to complete all aspects of the program each session they attended.

3.4.3 *Logbooks.* Each participant was given a personalized logbook (See Appendix E) which was used as both a guide for participants through their exercise program and as a tracking tool for participant adherence and progress. The logbooks listed each exercise and were updated weekly by a personal trainer. Logbooks remained in the exercise laboratory at all times and participants checked off each exercise as they completed it at each session.

CHAPTER 4: RESULTS

4.1 *Data Analysis*

Upon completion of the study, data were entered into the quantitative data analysis software program Statistical Package for the Social Sciences (SPSS) version 17.0 and a data set was generated from the questionnaires. Data analysis was completed in a series of stages.

4.1.1 *Treatment of Missing Data.* Data entered into SPSS was screened for data entry errors and missing values by examining univariate frequencies. Data entry errors were verified and corrected. The percentage of missing data was less than 1% and no participants missed an entire subscale from a questionnaire. In total, 13 participants did not complete the 16-week follow-up session. Therefore, for these participants, only their baseline data was used. The remaining data was inspected visually to determine whether or not there was a consistent pattern of missing data. There were 7 missing responses that were deemed random, so mean substitution from the participant's sub-group was used to replace missing data. Next, adherence to the exercise program and attendance records was screened visually to ensure participants included in the data analysis met the requirements of exercise frequency. All participants attended at least 80% of all possible exercise sessions.

4.1.2 *Reverse Coding and Subscale Score.* Where appropriate, items were reverse-scored such that higher scores represent a more positive body image. Next, mean scores were calculated for all MBSRQ subscales.

4.1.3 *Outliers.* The data were screened for univariate and multivariate outliers by group. Values with a standardized score (z-score) in excess of ± 3.29 ($p < .001$, two-

tailed test) as suggested by Tabachnick and Fidell (2007) were considered possible univariate outliers. Based on z-scores, one potential univariate outlier on the 'post-self-classified weight' variable from the SRN NEX group was identified. The value was investigated and was found to be more than 2 standard deviations below the next lowest score. The value was reduced to one standard deviation below the next most extreme score in the group. Next, the data were inspected for multivariate outliers, cases with a strange combination of scores on two or more variables. This was done by calculating Mahalanobis' distance. This criteria was evaluated against χ^2 with degrees of freedom equal to the number of variables of interest ($n = 10$) at $p < .001$ for pre- and post-exercise program body image (Tabachnick & Fidell, 2007). There were no cases with a Mahalanobis distance ≥ 22.46 , therefore, there was no indication of any multivariate outliers.

4.1.4 *Normality of Sampling Distribution: Skewness and Kurtosis.* All variables were assessed for normality by examining skewness and kurtosis values by group. The obtained skewness and kurtosis value for each variable by group were tested against a null hypothesis of zero using a significance test as outlined by Tabachnick and Fidell (2007). All tests were non-significant ($p > 0.05$), therefore, the assumption of normality was met.

4.1.5 *Linearity.* Linearity is the assumption that two variables are related to each other in approximately a straight line relationship (Tabachnick & Fidell, 2007). This assumption was assessed by creating and analyzing bivariate scatter plots by group for all possible combinations of variables. Through visual examination, it was determined that all variables were linearly related, therefore, the assumption of linearity was met.

4.1.6 *Homogeneity of Variance.* Homogeneity of variance, the assumption that the variability in each dependent variable is approximately the same for all groups (Tabachnick & Fidell, 2007), was assessed using F_{\max} in conjunction with sample size ratios as suggested by Tabachnick and Fidell (2007). Since group sizes were relatively equal (within a ratio of 4 to 1 or less), an acceptable ratio of the largest to smallest cell variance for pre- and post-exercise body image, F_{\max} as large as 10 was considered adequate (Tabachnick & Fidell, 2007). All F_{\max} values were acceptable ($F_{\max} < 4$), therefore, the assumption of Homogeneity of Variance was met.

4.1.7 *Multicollinearity.* Pearson bivariate correlations by group were completed to test for multicollinearity; when variables are very highly correlated, they may contain redundant information (Tabachnick & Fidell, 2007). Variables that were highly correlated ($r = .90$ or higher) were considered potential multicollinear variables. Correlations (see Tables 2 to 5) ranged from .000 to .942 with the highest between pre and post of each subscale.

4.2 *Hypothesis Testing*

Means, standard deviations and correlations between each of the MBSRQ subscales were calculated at both time points by group (see Tables 6 and 7). In order to answer the research questions, two subsequent analyses were conducted.

4.2.1 *Research Question #1.* Differences in body image at baseline between SRO women and SRN women, regardless of exercise group, were examined using a MANOVA where group (SRO and SRN) served as the independent variable and the

subscales of the MBSRQ was used as the dependent variables. The overall MANOVA was non-significant ($F(10, 57) = 1.33, p > .05$).

4.2.2 *Research Question #2.* A 2 x 2 x 2 (osteoporosis status x exercise group x time) repeated measures MANOVA were used to examine the effects of the exercise intervention on body image. Osteoporosis status (SRO and SRN), exercise group (EX and NEX) and time (baseline and 16-weeks) were used as the independent variables, with time as the repeated measures variable, and the subscales of the MBSRQ were used as the dependent variables. There were no significant main effects for exercise group ($F(10, 42) = 2.01, p > .05$), osteoporosis group ($F(10,42) = 2.05, p > .05$) or time ($F(10,42) = 1.82, p > .05$). There was also no interaction for time x osteoporosis group ($F(10,42) = 1.65, p > .05, \eta^2 = .28$) or time x osteoporosis group x exercise group ($F(10,42) = .69, p > .05, \eta^2 = .14$). However, there was a significant exercise group x time interaction ($F(10,42) = 5.44, p < .001, \eta^2 = .56$). To investigate the significant interaction, univariate ANOVAs were conducted. There was a significant time x exercise interaction for the following variables: AE ($F(1,51) = 9.32, p < .01, \eta^2 = .15$), FO ($F(1,51) = 30.65, p < .001, \eta^2 = .38$), HE ($F(1,51) = 7.78, p < .01, \eta^2 = .13$), HO ($F(1,51) = 15.12, p < .001, \eta^2 = .23$), and BASS ($F(1,51) = 10.61, p < .01, \eta^2 = .17$). Paired t-tests showed that the exercise group significantly increased on FO, HO, and BASS, while the non-exercise group significantly decreased on AE, HE, HO, and BASS. See Table 8 for all means.

Adherence to the exercise program was verified by the examination of participants' logbooks; attendance records were screened visually to ensure participants included in the data analysis met the requirements of exercise frequency (i.e., completion of 80% of all possible exercise sessions).

CHAPTER 5: DISCUSSION

The overall purpose of the current study was to examine body image in postmenopausal women with osteoporosis, and the impact of an exercise program on body image in this group. It was hypothesized that women who self-reported that they did not have osteoporosis would have a more positive body image than women who self-reported that they had the disease. It was also hypothesized that a 16-week exercise intervention would lead to improvements in body image for all women, but that the bigger improvements would be seen in those with osteoporosis. However, the hypotheses were only partially supported. There were no differences in body image between the two groups at baseline. Further, all exercisers, regardless of osteoporosis status, showed improvements in body image compared to those in the non-exercise control group, with no observed differences between SRO and SRN women

5.1 *Descriptive Data*

An examination of means of the MBSRQ subscales indicated that baseline scores were all above the midpoint of 2.5 on the 5-point scale for all groups. This indicates that baseline body image scores were generally positive and that women tended to be more satisfied than dissatisfied with appearance, health, and fitness aspects of their bodies. Regardless of self-report osteoporosis status, participants also tended to place a moderate amount of importance on appearance SRO ($M = 3.77$); SRN ($M = 3.64$), fitness SRO ($M = 3.43$); SRN ($M = 3.28$), health SRO ($M = 4.15$); SRN ($M = 3.79$), and illness SRO ($M = 3.45$); SRN ($M = 3.09$). In terms of evaluation, women reported the most positive scores for health evaluation, followed by fitness evaluation, and the least positive scores on

appearance evaluation. Further, the greatest importance was placed on appearance and health aspects of the body, while the least concern was reported for fitness and illness aspects. It should be noted that these same general patterns were found in the 16-week data as well. The finding of the primary importance of appearance has implications for a woman's body image across the lifespan, and is consistent with suggestions that although other aspects of body image become relatively more significant in older age, appearance remains an important consideration for women (Tiggemann, 2004).

Research conducted to examine differences in body image across the adult lifespan is limited and inconclusive. In general, the values found for the present sample are similar to those found in other samples of older women (Baker & Gringart, 2009; Rusticus & Hubley, 2006). For example, Rusticus and Hubley (2006) reported that evaluation scores were highest for health and lowest for appearance (they did not assess FE). They also reported health and appearance orientation scores to be higher than illness orientation, similar to the current sample. A study by Baker and Gringart (2009) used the MBSRQ to examine body image and self-esteem in older adults. They measured nine of the possible ten MBSRQ subscales (BASS not included). Specifically, in a subgroup of women ages 65 to 71 years of age, they reported means similar to those in the current investigation. Together, these findings suggest that older women generally still report a positive body image, consistent with Tiggemann's (2004) review article suggesting that body dissatisfaction remains stable for women across much of the adult lifespan, until women are quite elderly.

When comparing body image of older to younger samples, some age differences have been found (Reboussin et al., 2000). Some research suggests that older adults have

more positive attitudes toward their bodies than younger adults in some areas but not others (Franzoi & Koehler, 1998), while other research suggests that no differences exist across age groups (Grogan, 1999). Franzoi and Koehler (1998) reported that elderly women displayed more positive attitudes than young women in relation to weight concerns, while younger women expressed more positive attitudes than older women in relation to body functioning and facial attractiveness. Further, Oberg and Tornstam (1999) found that older women aged 65 to 85 years old rated the item 'I am satisfied with my body' more positively than younger women aged 45 to 54. Rusticus and Hubley (2006) suggest that satisfaction with appearance in particular may decline as women age. They examined body image in three age groups of women: younger (18-29 years), middle (30-54 years) and older (55+ years). They found that AE decreased as the age groups increased, and the values from the current study are consistent with this trend. By contrast, health evaluation generally increased across the 3 age groups (Rusticus & Hubley, 2006), and values in the current sample were also consistent with this finding. With aging, a woman's body moves further away from Western societies' ideal of thinness and youth, and body image may decline. Feingold and Mazzella (1998) suggested that women's body image is likely to benefit from aging, as they may experience fewer social pressures to meet the physical ideal. It is also possible that the standard or 'ideal' for older women is less narrowly defined; therefore, satisfaction with the body is not likely to decrease drastically for older women, as their changing bodies still fit within a wider range of acceptability. Thus, overall differences in body satisfaction between older and younger samples may result in part because 'satisfaction' is interpreted differently by older and younger women. Older women may relate this statement more to physical function and

ability while younger women may relate it more to physical appearance (Baker & Gringart, 2009). This shift in the importance of function rather than appearance as women age has been documented (Janelli, 1993; Reboussin et al., 2000) and is important when considering body image differences between these groups. Reboussin et al. (2000) concluded that there is a clear distinction between body function and body appearance and that older adults value body function more highly. While results from the present study support the increasing importance of function in older women, they also suggest that appearance remains important to them.

Investigation of the correlations between the various MBSRQ subscales of the current study reveal that at baseline, the same general trend was evident in all four groups, regardless of exercise participation or osteoporosis status. AE was significantly correlated to BASS in all four groups, and in addition with either one or both of OP, and SCW in all groups. Therefore, across all groups of women, body image seems to be influenced by body weight (Palmeira et al., 2009). This is similar to results observed in younger samples as well (Grogan, 1999). When a broader definition (beyond that of only appearance) of body image is considered, the evaluation of fitness and health seem to be unrelated to weight related aspects of body image such as BASS, OP, and SCW, thus highlighting the importance of investigating a broader, multi-component or multi-factorial definition of body image. The same trend was observed in all groups upon examination of the 16-week data, and even though body image improved in the exercise group, satisfaction was still related to perceptions of weight.

5.2 *Research Question #1*

The hypothesis that women who self-reported that they have osteoporosis would have a poorer overall body image than women who self-reported that they do not have the disease, was not supported. There are several reasons why these expected differences may not have been observed. First, the nature of the sample may have contributed to the lack of differences in body image between SRO and SRN women. Specifically, both groups of women were relatively young (M age SRO = 61.41 ± 4.77), M age SRN = 61.12 ± 4.62) and healthy. It is likely that the less severe stages of osteoporosis may not have limited participants in terms of their activities of daily living, as would the disease in its more advanced stages. This may also have been related to fewer decreases in health and/or fitness in this group of women. Of the SRO women, there were none with severe osteoporosis or with osteoporosis in its advanced stages; no women displayed any visible signs of the disease and only one woman had experienced a (wrist) fracture. The SRO women had not reached a point in the progression of osteoporosis that they experienced any visible hunched posture or kyphosis, two markers of severe osteoporosis that would be expected to negatively impact body image. It was hypothesized that women who self-reported osteoporosis would have poorer body image because the visible changes associated with chronic illness are generally associated with poorer body image (Baxter et al., 1996; Williams Utz et al., 1990), however, the absence of visible changes in this group, may account for the lack of differences observed.

Moreover, it is possible that differences in body image at baseline between SRO and SRN were not observed as a reflection of the self-report nature of osteoporosis classification. It is possible that a participant could have self-reported having osteoporosis,

when they did not actually have the disease. For instance, she could have confused osteoporosis with its precursor disease, osteopenia (low bone mass). On the contrary, women may also have self-reported not having osteoporosis when in fact they did actually have the disease without knowing it. Osteoporosis is referred to as the ‘silent disease’ because it often has no symptoms until a fracture occurs or until a bone density test reveals the significant decrease in bone mass (Osteoporosis Canada, 2009). Therefore, inaccuracies in self-reporting could have influenced the formation of SRO and SRN groups according to osteoporosis status; clinical diagnosis (i.e., use of DXA) could overcome this limitation. However, it should also be noted that it may be the perception of the disease, rather than the disease itself, that may be more influential on body image.

A third factor that may explain why baseline differences in body image were not observed between the SRO and SRN groups is the presence of other conditions or diseases that were not part of the exclusion criteria for the current study. It is possible that these conditions could also impact body image. For example, another chronic illness such as cardiovascular disease, cancer or diabetes could have an impact; if a woman feels she is overweight or obese, she may have a more negative body image regardless of osteoporosis status. Similarly, other diseases such as breast cancer (Baxter et al., 1996) or cardiovascular disease (Williams Utz et al., 1990) could negatively impact a woman’s body image and therefore, influence results of the present study.

Also, due to participant recruitment strategies, and the nature of the current study (i.e., the possibility to be randomly assigned to the exercise intervention), it is likely that participants who volunteered for the study had a more positive overall body image, and may have had a belief that their health was important. Individuals with poorer body

image may be less likely to exercise, as it forces them to be in a situation where their bodies are on display to others (Lanning et al., 2004). Given it was the initiative of participants to join the current investigation, the sample was inherently at least of moderate health and function, as they were leaving their homes multiple times per week to attend the exercise sessions. It is likely that differences in body image at baseline may have been observed if a more sedentary, less independent, or less functional group of women were used as a sample for the current investigation.

It is important to discuss the measurement of body image, and specifically the use of the MBSRQ, and the role it may have played in terms of a lack of significant body image differences observed between the two groups at baseline. This questionnaire was designed and developed for use by men and women across the lifespan (Cash, 2000). It is also the only measure of body image to assess both the evaluation of and investment in body image, and to address body image as a multidimensional construct that includes more than just appearance (i.e., health, fitness, illness). As such, it was considered the most appropriate measure for this sample. However, closer investigation of specific items reveals that some questions may not be as relevant for this group. For example, items such as ‘My body is sexually appealing’, ‘Participating in sports is unimportant to me’ and ‘I do poorly in physical sports of games’ may be more appropriate for younger individuals. Older individuals may be more invested in or concerned with issues relating to functional capacity as it relates to activities of daily living (rather than sport) that a person can competently achieve.

Further, in relation to osteoporosis, it is possible that the MBSRQ does not adequately address the specific characteristics of the disease that could have the greatest

impact on body image. For instance, for those diagnosed with osteoporosis, there are several movements that are contraindicated, such as unsupported forward flexion, rapid twisting, and twisting with forward flexion that could influence one's body image through their impact on body functioning. Simply being told that it is unsafe to move their bodies in these common ways may impact people's perceptions of their fitness, physical abilities and functional capacity. Further, these movements are typically part of common daily activities such as sweeping, vacuuming, and gardening. Being told not to perform these movements could impact body image through a decrease in satisfaction with daily functioning of the body. Also, the perception of frailty of the body associated with an increase in risk of fractures (particularly fragility fractures which result from forces that should not lead to fracture in normal, healthy bone, such as falling from standing; Papaioannou et al., 2010) may also lead to declines in body image. However, none of these aspects of body image are addressed in the MBSRQ.

Collectively, these functional and health and/or illness related elements of body image may be better addressed through an alternate measure of body image, ideally, one developed specifically for older women diagnosed with osteoporosis. This approach has been used successfully in examining body image in women with other chronic diseases. For instance, specific measures have been developed to assess body image in women diagnosed with breast cancer, such as the Body Image and Relationships Scale (BIRS; Hormes et al., 2008), which was developed to assess attitudes about appearance, health, physical strength, sexuality, relationships, and social functioning following breast cancer treatment (Hormes et al., 2008). In addition, The Functional Assessment of Cancer Therapy-Breast (FACT-B) is a questionnaire that has been used to assess quality of life,

psychological well-being and exercise behaviour related outcomes in women with breast cancer (Daley, Mutrie, Crank, Coleman, & Saxton, 2004). The Body Integrity Subscale is another measure of body image that has been used among cancer patients (Hopwood, 1993). These measures assess aspects of body image that are related specifically to concerns about the body in women with breast cancer (e.g., reduction in feelings of being sexually attractive; feelings about the ‘wholeness’ of the body, especially following mastectomy; Daley et al., 2004; Hopwood, 1993; Hormes et al., 2008). If similar and comparable measures were developed for women with osteoporosis, it could provide a more accurate assessment of how body image is affected specifically by this disease.

Finally, it should be noted that although no significant differences were found between the two osteoporosis groups, approximately 20% of the variance in differences between the body image scores was accounted for by osteoporosis status. According to Cohen (1992), this effect size is considered small (but still practically important), and may indicate that the sample size for the current study was not large enough to detect significant differences.

5.3 *Research Question #2*

The second research question of the current study investigated whether or not participation in the 16-week exercise intervention had an impact on body image in post-menopausal women who self-reported that they had osteoporosis, compared to women who self-reported that they did not have the disease, when women who exercised (EX) were compared to women who did not (NEX). The hypothesis that all women (whether they self-reported having osteoporosis or not) in the exercise group would show

improvements in body image, as reflected by increased scores on the MBSRQ was supported. However, contrary to the hypotheses, these improvements were observed in both exercise groups, regardless of osteoporosis status. Results of the current study indicated that the exercise intervention had a positive impact on body image in all women (both SRO and SRN). Overall, participation in the exercise program was associated with improvements in several aspects of body image. In the exercise group, increases in FO, HO, and BASS from baseline to 16-weeks were found, indicating a more positive body image following exercise. In addition, from baseline to 16-weeks, the non-exercise control group decreased on several of the body image subscales (AE, HE, HO, and BASS), indicating their body image became more negative. On these same subscales (with the exception of BASS and HO), no changes were seen in the exercise group, suggesting that the exercise program helped prevent some declines in body image.

When discussing differences between the two exercise groups, it is important to note that following exercise, the exercise group reported increased importance (i.e., orientation) placed on health and fitness, while the non-exercise group changed in terms of health and fitness related to a more negative evaluation. This may be related to the functional outcomes (e.g., falls, decreased mobility) that are important to women living with osteoporosis, or who are at risk of osteoporosis. For women who have a chronic illness or are at increased risk of developing such an illness, the functional aspects of their bodies may be more salient and increase in importance. Further, the fact that they participated in an exercise program for 16 weeks may have also led them to perceive that fitness is an important aspect of their bodies.

These results are consistent with three recent meta-analyses showing the positive impact of exercise on body image (Campbell & Hausenblas, 2009; Hausenblas & Fallon, 2006; Reel et al., 2007). Campbell and Hausenblas (2009) conducted a meta-analysis of exercise intervention studies on body image that specifically included older adults. They reported the greatest effect sizes for adults ($ES = .44$) and older adults ($ES = .33$), compared to university students ($ES = .22$) and adolescents ($ES = .16$). The current study is consistent with this research indicating that body image in older adults can be improved using an exercise intervention. It is also consistent with previous research that has examined the impact of exercise interventions on body image in older adults specifically. For example, a study by McAuley et al. (1995) examined the relationships among body composition, exercise participation, and physique anxiety (an affective measure of body image) in a group of middle-aged, formerly sedentary males and females participating in a 20-week aerobic exercise program. Participants reduced their weight, body fat, body circumferences, and physique anxiety over the course of the intervention (McAuley et al., 1995).

There are several possible explanations for the improvements on body image for both exercise groups. In particular, both physical and psychological outcomes of the exercise intervention may explain the positive effects on body image associated with participation in the exercise program. Physically, there are numerous benefits of exercise that could be associated with improvements in body image. The short-term outcomes of physical activity participation, and the benefits of exercise that an individual will likely notice most quickly following exercise may be associated with these improvements. For example, increases in physical capacity in terms of muscular strength/endurance,

cardiovascular endurance, flexibility and balance are improvements likely observed within the first few weeks of participation in exercise. In the current study, participants could identify these changes easily as their activity was documented and tracked using their personal logbook at each session. For instance, participants could see the increases in the amount of weight lifted in a particular exercise, or the number of repetitions completed. In addition, many participants noted increases in their ability to walk or cycle at a greater intensity or for a longer time as they progressed through the 16-week program. It is likely that these improvements noted by participants in their logbooks would affect physical appearance (e.g. weight loss and increased muscle tone), which could impact body image, in particular with respect to appearance (i.e., AE and BASS). Thus, these short-term physical changes associated with exercise may lead to improvements in satisfaction with one's appearance.

However, it is also likely that these improvements, in the longer run, would also impact body image, as physical activity is associated with numerous health and functional benefits. For example, benefits such as the prevention of osteoporosis and the reduction of fractures (Nelson et al., 2007), protection against cardiovascular disease (Dunn et al., 1999), weight control (Dunn et al., 1999), improved sleep patterns (Mock et al., 1994) and protection against breast and colorectal cancer (Sternfeld, 1992) may all result from the physical changes associated with exercise. Through participation in the current exercise program, it is possible that these long-term changes associated with exercise may explain, at least in part, improvements in satisfaction with appearance. Supporting this contention, Reboussin et al. (2000) found improvements in cardiovascular fitness following exercise were directly related to satisfaction with body

appearance in older adults. Similarly, McAuley et al. (1995) found that in adults aged 45-54, increases in lean body mass were associated with improvements in body image (specifically physique anxiety).

However, it should be noted that in most studies finding relationships between physical changes associated with exercise and improvements in body image, these changes do not account for all of the variance in body image improvements. Lox et al. (2010) suggested that perceptions of improvement may also be associated with changes in body image. For instance, in a sample of college-aged students, a combination of actual physical change and perceptions of physical change were associated with improvements in body image in women (Martin Ginis, Eng, Arbour, Hartman, & Phillips, 2005). Further, McAuley et al. (2002) found in a group of older adults (aged 60-75 years) that two types of exercise programs (aerobic exercise and stretching/toning) were associated with decreases in SPA. However, they also found that decreases in body weight and frequency of exercise were unrelated to changes in SPA. In the current study, it is possible that viewing the logbooks, and improvements in performance each day, may have also led to improvements in body image over and above any actual physical changes. Women who noted that they lifted more weight, or performed greater amounts of cardiovascular exercise, may have assumed an improved fitness, and may have interpreted this as a direct improvement in their appearance and health.

It is also possible that the exercise program increased the awareness that the women placed on their physical abilities, leading to changes in body image (Lox et al., 2010). Lox et al. (2010) suggested that exercise may focus attention on what the body can do, rather than what it looks like, and that this shift may be particularly true in women.

Evidence from the present study supports this contention. Specifically, women in the exercise group showed increases in the importance they placed on health and fitness, while the control group showed a decrease in the importance placed on being healthy, following the 16-week intervention. Following the intervention, however, no changes in the importance placed on appearance were noted in either group. Martin and Lichtenberger (2002) suggested that a focus on fitness resulting from exercise may be beneficial for body image because Western society does not have a strictly defined 'ideal' fitness for women, unlike the ideal for appearance.

In addition to improvements in satisfaction with the body, participants in the exercise intervention also reported greater importance (i.e., investment) on several aspects of body image, including fitness and health following exercise. This aspect of body image had not previously been examined in older adults. Increased scores on FO and HO in the exercise group indicate that participants were more aware of the importance of fitness and body function following participation in the exercise program. This increased awareness may have been due to the increased functional capacity and abilities experienced as a result of the program. For example, participants made anecdotal notes and commented that they noticed improvements in their strength, balance and flexibility. Participants frequently related these improvements in physical abilities to their competence with tasks in their daily lives (e.g., picking up grocery bags, reaching for items in cupboards, sweeping, vacuuming, etc.). This increased awareness of the importance of fitness and health is beneficial to this group and likely contributed to the adherence and subsequent success experienced by participants in the exercise program. If

an individual values health and fitness more highly, they are more likely to engage in behaviours and make lifestyle choices that promote good health and well-being.

In addition, it is possible that improvements in body image as a result of the exercise intervention could also be associated with changes in psychological variables. For example, participants may have felt that they had more control over their fitness and health, or may have felt that they had improved their ability to function physically and complete tasks after participating in the intervention and its various components (i.e., increased self-efficacy; Bandura, 1997). It is likely that improvements in self-efficacy are associated with improvements in body image. For example, McAuley et al. (2002) found that increases in physical self-efficacy were associated with decreases in physique anxiety in older adult men and women in an exercise intervention. In addition to self-efficacy, exercise has also been related to a more positive body image directly through improvements in self-esteem, mood, depression (Nelson, 1991; Weyerer & Kupfer, 1994) and anxiety (LaFontaine et al., 1992).

The hypothesis that within those who exercised, a greater improvement would be observed in the women who self-reported that they had osteoporosis compared to those who self-reported that they did not have osteoporosis, was not supported. To date, there has been no research that has examined the relationship between participation in an exercise program and body image in women with osteoporosis. However, a few studies have looked at this relationship in those with other chronic diseases, such as individuals with spinal cord injuries (Hicks et al., 2003), and women with breast cancer (Pinto, Frierson, Rabin, Trunzo, & Marcus, 2003; Pinto & Maruyama, 1999; Pinto & Trunzo, 2004). For example, Pinto and Trunzo (2004) studied body esteem and mood states

among breast cancer survivors and compared sedentary and physically active women. Their results indicated that among breast cancer survivors over 50 years of age, exercisers reported higher vigour, less confusion, anger, fatigue, depression, and total mood disturbance than sedentary women (Pinto & Trunzo, 2004). Similarly, Pinto et al. (2003) found that women who had received treatment for breast cancer showed improved body image following a 12-week structured exercise program compared to similar women who did not exercise. However, the effectiveness of exercise interventions for women with breast cancer was not compared to its effectiveness in women without breast cancer. It is possible that no differences would have been observed if the women with breast cancer had been compared to those without it.

However, it is also possible that the lack of differences between those who self-reported osteoporosis and those who did not may be due to the nature of osteoporosis itself. Although it is chronic and progressive in nature, the changes to the body associated with osteoporosis are not readily apparent until the disease is extremely severe (i.e., hunched posture, protruding abdomen). In fact, osteoporosis is often called the 'silent disease' as it has no symptoms until a fracture occurs. Further, although there are some specific movements that are to be avoided by those with osteoporosis (e.g., unsupported forward flexion), it is still possible to perform the majority of activities of daily living with few adaptations necessary; thus, osteoporosis may not impact functional aspects of body image as severely as other chronic conditions. In addition, osteoporosis is not considered as severe or life-threatening as many other diseases (Gerend, Aiken, West, & Erchull, 2004) and may therefore, not have had as large of an impact on body image. Finally, it is also possible that the characteristics of the sample (i.e., relatively young and

healthy) and the self-report of osteoporosis may have also contributed to the lack of differences. Because of the similarities between the two groups in age, and the lack of functional and physical limitations of the osteoporosis group (i.e., they were all independent and able to perform exercise), there may have been few functional differences between the two groups. This lack of difference in body image following the exercise intervention between those who self-reported osteoporosis and those who did not is supported by suggestions that exercise should be most beneficial in those whose body image is threatened by illness or disease (Martin & Lichtenberger, 2002). In the present sample, the relatively positive body image prior to the intervention in those who self-reported osteoporosis may have made it more difficult to determine greater improvements in body image.

5.4 *Limitations*

Several limitations to this study should be noted. A small sample size may have made it difficult to find differences between the two osteoporosis groups, particularly given the relatively small effect sizes ($\eta^2 = .20$). In addition, participants who did self-report having osteoporosis were in the early stages of the disease and the physical symptoms that may impact body image would not have been evident until the later stages of the disease. If participants had been in later stages of osteoporosis, it is possible that more differences between the two groups would have been found.

Sample characteristics for the volunteers limit the generalizability of the findings. All participants were relatively young and healthy, and were willing to participate in an exercise program. Further, it is likely that the women who volunteered for the study

would have had a relatively positive body image when they contacted the researchers; it is unlikely that those with very negative body image would volunteer for a study about their body image. Thus, results can be generalized only to this group.

In addition, the self-report nature of the data should be considered, as it may have been susceptible to recall error or a social desirability bias. In particular, the self-report nature of disease-status should be considered. Specifically, it is possible that not all women actually had osteoporosis. It is possible that women may have mistakenly believed they had the disease (e.g., they had low bone mass [osteopenia] but not osteoporosis, they may have believed that being at risk for osteoporosis was the same as having it, or they may have misunderstood diagnosis from their doctors), or they may have intentionally reported the diseases in order to be included in the study. It is possible that if the two groups had had an objective measure of osteoporosis status (i.e., DXA), then the results may have been different. However, it is also possible that when looking at a psychological variable such as body image, these perceptions could be influenced by the belief that one has osteoporosis, rather than the disease itself. It is also possible that the body image data was influenced by a social desirability bias; women may not have wanted to admit that they were concerned with their physical appearance.

Only data about attendance at the exercise sessions was collected through the logbooks. It is possible that the women in the exercise program may not have completed all exercises at every session, or may not have completed them properly. Although every attempt was made to ensure that participants completed all exercises each time they came, participants may not have adhered completely to the program.

Finally, the measure of body image, although used with older female samples, has only limited evidence of validity and reliability in this sample. It was considered to be the best measure of body image available for this sample, given that it focused on aspects of body image beyond just appearance (i.e., health, fitness, and illness) and considered both evaluation and investment in body image. However, it likely does not measure all aspects of body image that may be important to this sample (e.g., satisfaction with the body's functioning).

5.5 *Future Directions*

Future studies should investigate the impact of a similar exercise intervention program in women with more severe osteoporosis. This may be possible with the assistance of physicians or medical practitioners during participant recruitment. In future studies the diagnosis of osteoporosis may be determined using a DXA, as opposed to the self-report measures used in the current investigation. Furthermore, results of the current investigation indicate that there is a need for an osteoporosis specific measure of body image, that the best measures currently available are not specific to the various characteristics and implications of the disease. A measure of body image more oriented to this group would provide more meaningful data by which to investigate changes in body image and other psychological variables in this group. In addition, future research may investigate whether or not specific types of exercise (e.g., cardiovascular, strength, flexibility) training are more beneficial for improving body image in women with osteoporosis.

5.6 *Implications*

The present study suggests that body image in older women, including those suffering from a chronic disease such as osteoporosis, can benefit from participation in structured exercise programs. Even over a relatively short duration, several improvements in body image were seen in those who exercised, while those who did not exercise showed some declines in body image. A major advantage to this type of mixed-supervision exercise facility, with student research assistants present, is that women can ensure that they are safely completing each component of the program. The program is ideal for this group of women, as it was been designed in consideration of the needs and contraindications to exercise for this specific population. Women suffering from osteoporosis may experience visible changes to the body, as well as behavioural and functional life changes stemming from the contraindications related to the disease, which may impact body image. Exercise is one way to improve some of the negative physical and functional decreases experienced as a result of aging and osteoporosis.

5.7 *Conclusions*

The current investigation showed that a structured exercise program could lead to improvements in body image in older women, regardless of self-report osteoporosis status. This finding is consistent with the existing research, indicating that participation in an exercise program has a beneficial effect on body image in older adults (Campbell & Hausenblas, 2009). While motivations to participate, or motivations to exercise were not considered in the current sample, it is likely that as suggested by Schuler et al. (2004),

older adults are not primarily motivated to exercise by body-shape dissatisfaction, but rather by body appearance in combination with elements of physical health and fitness.

REFERENCES

- Ackard, D.M., Croll, J.K., & Kearney-Cooke, A. (2002). Dieting among college females: Association with disordered eating, body image, and related psychological problems. *Journal of Psychosomatic Research, 52*, 129-136.
- Baker, L. & Gringart, E. (2009). Body image and self-esteem in older adulthood. *Ageing and Society, 29*, 977-995.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.
- Bane, S. & McAuley, E. (1998). Body Image and Exercise. In J. Dula (Ed.), *Advances in sport and exercise psychology measurement* (pp. 311-322). Morgantown, West Virginia: Fitness Information Technologies, Inc.
- Baxter, N., Goodwin, P., Bombardier, C., Devins, G.M., Toner, B. & McLeod, R. (1996). Body image after breast cancer: Results from a patient derived measure. *European Journal of Cancer, 32*, 33-34.
- Blair, S.N., Horton, E., Leon, A.S., Lee, I.M., Drinkwater, B.L., Dishman, R.K., Mackey, M., & Kienholz, M.L. (1996). Physical activity, nutrition, and chronic disease. *Medicine and Science in Sports and Exercise, 28*, 335-349.
- Campbell, A. & Hausenblas, H.A. (2009). Effects of exercise interventions on body Image: A meta analysis. *Journal of Health Psychology, 14*(6), 780-793.
- Canadian Society for Exercise Physiology. (2002). *Physical Activity Readiness Questionnaire (PAR-Q)*. Retrieved from <http://www.csep.ca/communities/c574/files/hidden/pdfs/par-q.pdf>.
- Cash, T.F. (2000). *The multidimensional Body-Self-Relations Questionnaire*

- users' manual*. Virginia: Body Images Research Consulting.
- Cash, T.F. (2004). Body image: Past, present, and future. *Body Image: An International Journal of Research, 1*, 1-5.
- Cash, T.F. (2005). The influence of sociocultural factors on body image: Searching for constructs. *Clinical Psychology: Science and Practice, 12*, 438-442.
- Cash, T. F. & Henry, P.E. (1995). Women's body images: The results of a national survey in the USA. *Sex Roles: A Journal of Research, 33*, 19-28.
- Chan, K.M., Anderson, M., & Lau, E.M. (2003). Exercise interventions: defusing the world's osteoporosis time bomb. *Bulletin of the World Health Organization, 81*, 827-830.
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155-159.
- Daley, A.J., Mutrie, N., Crank, H., Coleman, R., & Saxton, J. (2004). Exercise therapy in women who have had breast cancer: design of the Sheffield women's exercise and well-being project. *Health Education Research, 19*, 686-697.
- Deeks, A.A. & McCabe, M.P. (2001). Menopausal stage and age perceptions of body image. *Psychology & Health, 16*, 367-379.
- Dunn, A.L., Marcus, B.H., Kampert, J.B., Garcia, M.E., Kohl, H.W., & Blair, S.N. (1999). Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness. A randomized trial. *Journal of the American Medical Association, 281*, 327-334.
- Eklund, R.C. & Bianco, T. (2000). Social physique anxiety and physical activity among adolescents. *Reclaiming Children and Youth, 9*, 139-142.
- Falahati-Nini, A., Riggs, B.L., Atkinson, E.J., O'Fallon, W.M., Eastell, R., & Khosla, S.

- (2000). Relative contributions of testosterone and estrogen in regulating bone resorption and formation in normal elderly men. *Journal of Clinical Investigation*, *106*, 1553-1560.
- Feingold, A., & Mazzella, R. (1998). Gender differences in body image are increasing. *Psychological Science*, *9*, 190-195.
- Fletcher, G.F., Balady, G., Blair, S.N., Blumenthal, J., Caspersen, C., Chaitman, B., Epstein, S., Sivarajan Froelicher, E.S., Froelicher, V.F., Pina, I.L., & Pollock, M.L. (1996). Statement on exercise: Benefits and recommendations for physical activity programs for all Americans. *Circulation*, *94*, 857-862.
- Franzoi, S., & Koehler, V. (1998). Age and gender differences in body attitudes: A comparison of young and elderly adults. *International Journal of Aging and Human Development*, *47*, 1-10.
- Franzoi, S.L., & Shields, S.A. (1984). The Body-Esteem Scale. *Journal of Personality Assessment*, *48*, 173-178.
- Friedman, K.E., Reichmann, S.K., Costanzo, P.R., & Musante, G.J. (2002). Body image partially mediates the relationship between obesity and psychological distress. *Obesity Research*, *10*, 33-41.
- Furnham, A., Badmin, N., & Sneade, I. (2002). Body image dissatisfaction: Gender differences in eating attitudes, self-esteem, and reasons for exercise. *The Journal of Psychology*, *136*, 581-596.
- Garner, D.M. (1997). The 1997 body image survey results. *Psychology Today*, *30*, 30-41.
- Gerend, M., Aiken, L., West, S., & Erchull, M. (2004). Beyond medical risk:

- Investigating the psychological factors underlying women's perceptions of susceptibility to breast cancer. *Health Psychology, 23*, 247-258.
- Glauber, H.S., Vollmer, W.M., Nevitt, M.C., Ensrud, K.E., & Orwoll, E.S. (1995). Body weight versus body fat distribution, adiposity, and frame size as predictors of bone density. *Journal of Clinical Endocrinology & Metabolism, 80*, 1118-1123.
- Goldsberry, E., Shim, S., & Reich, N. (1996). Women 55 years and older: Part II. Overall satisfaction and dissatisfaction with the fit of ready-to-wear. *Clothing and Textiles Research Journal, 14*, 121-132.
- Grogan, S. (1999). *Body image: Understanding body dissatisfaction on men, women, and children*. Routledge: London.
- Hausenblas, H.A. & Fallon, E.A. (2006). Exercise and body image: A meta-analysis. *Psychology and Health, 21*, 33-47.
- Halliwell, E. & Dittmar, H. (2003). A qualitative investigation of women's and men's body image concerns and their attitudes toward aging. *Sex Roles, 49*, 675-684.
- Hicks, A.L., Martin, K.A., Ditor, D.S., Latimer, A.E., Craven, C., Burgaresti, J., et al. (2003). Long-term exercise training in persons with spinal cord injury: effects on strength, arm ergometry performance and psychological well-being. *Spinal Cord, 41*, 34-43.
- Hopwood, P. (1993). The assessment of body image in cancer patients. *European Journal of Cancer, 29*, 276-281.
- Hormes, J.M., Lytle, L.A., Gross, C.R., Ahmed, R.L., Troxel, A.B., & Schmitz, K.H.

- (2008). The body image and relationships scale: Development and validation of a measure of body image in female breast cancer survivors. *Journal of Clinical Oncology, 26*, 1269-1274.
- Janelli, L.M. (1993). Are there body image differences between older men and women? *Western Journal of Nursing Research, 15*, 327-339.
- Kaminski, P.L. & Hayslip, B. (2006). Gender differences in body self esteem among older adults. *Journal of Women and Aging, 18*, 19-35.
- Klein, R. & Klein, S. (2000). Consumption and self-schema changes throughout the identity project life cycle. *Advances in Consumer Research, 27*, 279-285.
- LaFontaine, T.P, DiLorenzo, T.M., Frensch, P.A., Stucky-Ropp, R.C., Bargman, E.P., & McDonald, D.G. (1992). Aerobic exercise and mood. A brief review, 1985-1990. *Sports Medicine, 13*, 160-167.
- Lanning, B.A., Bowden, R.G., Owens, R., & Massey-Stokes, M. (2004). Relations of sex, age, perceived fitness, and aerobic activity with social physique anxiety in adults sixty years and older. *Psychological Reports, 95*, 761-766.
- Lewis, D. M. & Cachelin, F.M. (2001). Body image, body dissatisfaction, and eating attitudes in midlife and elderly women. *The Journal of Treatment and Prevention, 9*, 29-39.
- Lox, C.L., Martin Ginis, K.A., & Petruzzello, S.J. (2006). *The psychology of exercise: Integrating theory and practice*. Scottsdale, Arizona: Holcomb Hathaway, Publishers.
- Martin, K. A., Leary, M. R., & Rejeski, W. J. (2000). Self-presentational concerns

- in older adults: Implication for health and well-being. *Basic and Applied Social Psychology*, 22, 169-179.
- Martin, K.A., & Lichtenberger, C.M. (2002). In: *Body image: A handbook of theory, research, & clinical practice*. New York: The Guilford Press.
- Martin Ginis, K.A. Eng, J.J., Arbour, K.P., Hartman, J.W., & Phillips, S.M. (2005). Mind over muscle: Sex differences in the relationship between body image change and subjective and objective physical changes following a 12-week strength-training program. *Body Image*, 2, 363-372.
- McAuley, E., Bane, S.M., Rudolph, D.L., & Lox, C.L. (1995). Physique anxiety and exercise in middle-aged adults. *Journals of Gerontology*, 50B, 229-235.
- McAuley, E., Marquez, D.X., Jerome, G.J., Blissmer, B., & Katula, J. (2002). Physical activity and physique anxiety in older adults: Fitness, and efficacy influences, *Aging and Mental Health*, 6, 222-230.
- Miller, C.T. & Downey, K.T. (1999). A meta-analysis of heavyweight and self-esteem. *Personality and Social Psychology Review*, 31, 68-84.
- Mock, V. (1993). Body image in women treated for breast cancer. *Nursing Research*, 42, 153-157.
- Mock, V., Burke, M., Sheehan, P., Creaton, E., Winningham, M., McKenney-Tedder, S., et al. (1994). A nursing rehabilitation program for women with breast cancer receiving adjuvant chemotherapy. *Oncology Nursing Forum*, 21, 991-1000.
- Monteath, S.A. & McCabe, M.P. (1997). The influence of societal factors on female body image. *Journal of Social Psychology*, 137, 708-727.
- Montepare, J.M. (1996). Actual and subjective age-related differences in women's

attitudes toward their bodies across the life span. *Journal of Adult Development*, 3, 171-182.

National Institutes of Health Osteoporosis and Related Bone Diseases National Resource Center. (2000). *Osteoporosis Overview*. Retrieved November 25th, 2009, from http://www.niams.nih.gov/Health_Info/Bone/Osteoporosis/default.asp.

Nelson, J.P. (1991). Perceived health, self-esteem, health habits, and perceived benefits and barriers to exercise in women who have and who have not experienced stage I breast cancer. *Oncology Nursing Forum*, 18, 1191–1197.

Nelson, M.E., Rejeski, J., Blair, S.N., Duncan, P.W., Judge, J.O., King, A.C., et al. (2007). Physical activity and public health in older adults. Recommendation from the American college of sports medicine and the American heart association. *Circulation*, doi: 10.1161/CIRCULATIONAHA.107.185650.

Netz, Y., Wu, M., Becker, B.J., & Tenenbaum, G. (2005). Physical activity and psychological well-being in advanced age: A meta-analysis of intervention studies. *Psychology and Aging*, 20, 272-284.

Oberg, P., & Tornstam, L. (1999). Body images among men and women of different ages. *Ageing and Society*, 19, 629-644.

Osteoporosis Canada. (2009). *About Osteoporosis*. Retrieved November 3rd, 2009, from <http://www.osteoporosis.ca/english/about%20osteoporosis/default.asp?s=1>.

Palmeira, A.L. Markland, D.A., Silva, M.N., Branco, T.L., Martins, S.C., Minderico, C.S., et al. (2009). Reciprocal effects among changes in weight, body image, and other psychological factors during behavioral obesity treatment: A mediation

- analysis. *International Journal of Behavioural Nutrition and Physical Activity*, 6.
doi: 10.1186/1479-5868-6-9.
- Papaioannou, A., Morin, S., Cheung, A.M., Atkinson, S., Brown, J.P., Feldman, S.,
Hanley, D.A., Hodsman, A., Jamal, S.A., Kaiser, S.M., Kvern, B., Siminoski, K.,
& Leslie, W.D. (2010). 2010 clinical practice guidelines for the diagnosis and
management of osteoporosis in Canada: Summary. *Canadian Medical
Association Journal*, doi:10.1503/cmaj.100771.
- Park, D. & Gutchess, A. (2006). The cognitive neuroscience of aging and culture.
Current Directions in Psychological Science, 15, 105-108.
- Parker, P.A., Youssef, A., Walker, S., Basen-Engquist, K., Cohen, L., Gritz, E.R., Wei,
Q.X., & Robb, G.L. (2007). Short-term and long-term psychosocial adjustment
and quality of life in women undergoing different surgical procedures for breast
cancer. *Annals of Surgical Oncology*, 14, 3078-3089.
- Pearlman, R.A. & Uhlmann, R.F. (1988). Quality of life in chronic diseases: Perceptions
of elderly patients. *Journal of Gerontology*, 43, M25-M30.
- Pinto, B.M., Frierson, G.M., Rabin, C., Trunzo, J.J., & Marcus, B.H. (2003). Home-based
physical activity intervention for breast cancer patients. *Journal of Clinical
Oncology*, 23, 3577-3587.
- Pinto, B.M. & Maruyama, N.C. (1999). Exercise in the rehabilitation of breast cancer
survivors. *Psycho-Oncology*, 8, 191-206.
- Pinto, B.M. & Trunzo, J.J. (2004). Body esteem and mood among sedentary and active
breast cancer survivors. *Mayo Clinic Proceedings*, 79, 181-186.
- Pothiwala, P., Evans, E.M., & Chapman-Novakofski, K.M. (2006). Ethnic variation in

risk for osteoporosis among women: A review of biological and behavioral factors. *Journal of Women's Health, 5*, 709-719.

- Prichard, I. & Tiggemann, M. (2005). Objectification in fitness centers: Self-objectification, body dissatisfaction, and disordered eating in aerobic instructors and aerobic participants. *Sex Roles, 53*, 19-28.
- Reboussin, B.A., Rejeski, W.J., Martin, K.A., Callahan, K., Dunn, A.L., King, A.C., & Sallis, J.L. (2000). Correlates of satisfaction with body function and body appearance in middle- and older aged adults: The activity counseling trial (ACT). *Psychology and Health, 15*, 239-254.
- Reel, J.J., Greenleaf, C., Baker, W.K., Aragon, S., Bishop, D., Cachaper, C., Handwerk, P., Locicero, J., Rathburn, L. & Reid, W.K., & Hattie, J. (2007). Relations of body concerns and exercise behaviour: A meta-analysis. *Psychological Reports, 101*, 927-942.
- Ricciardelli, L.A. & McCabe, M.P. (2001). Children's body image concerns and eating disturbance: A review of the literature. *Clinical Psychology Review, 21*, 325-344.
- Rose, D. (2003). Fallproof!: A comprehensive balance and mobility training program. Champaign, IL: Human Kinetics.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Rubio, K.B. & Deusen, J. (1995). Relation of perceptual and body image dysfunction to activities of daily living of persons after stroke. *American Journal of Occupational Therapy, 49*, 551-559.

- Rudd, N.A. & Lennon, S.J. (2000). Body image and appearance-management behaviours in college women. *Clothing and Textiles Research Journal*, 18, 152-162.
- Rusticus, S.A. & Hubley, A.M. (2006). Measurement invariance of the multidimensional body-self relations questionnaire: Can we compare across age and gender? *Sex Roles*, 55, 827-842.
- Sarwer, D.B., Whitaker, L.A., Pertschuk, M.J., & Wadden, T.A. (1998). Body image concerns of reconstructive surgery patients: An underrecognized problem. *Annals of Plastic Surgery*, 40, 403-407.
- Schilder, P. (1950). *The image and appearance of the human body: Studies in the constructive energies of the psyche*. New York: International Universities Press, Inc.
- Schover, L.R., Yetman, R.J., & Tuason, L.J. (1995). Partial mastectomy and breast reconstruction: A comparison of their effects of psychological adjustment, body image, and sexuality. *Cancer*, 75, 54-64.
- Schuler, P.B., Broxon-Hutcherson, A., Philipp, S.F., Ryan, S., Isosaari, R. M., & Robinson, D. (2004). Body-shape perceptions in older adults and motivations for exercise. *Perceptual and Motor Skills*, 98, 1251-1260.
- Sediak, C.A. & Doheny, M.O. (2000). Fashion tips for women with osteoporosis. *Orthopedic Nursing*, 19, 31-35.
- Siegel, I. (2010). Does body weight dissatisfaction change with age? A cross-sectional analysis of American women. *The New School Psychology Bulletin*, 7, 42-50.
- Soroko, S.B., Barrett-Connor, E., Edelman, S.L., & Kritz-Silverstein, D. (1994). Family

- history of osteoporosis and bone mineral density at the axial skeleton: The Rancho Bernado Study. *Journal of Bone and Mineral Research*, 9, 761-769.
- Sternfeld, B. (1992). Cancer and the protective effect of physical activity: the epidemiological evidence. *Medicine & Science in sports & Exercise*, 24, 1195-1209.
- Stewart K.J., Mason, M., & Kelemen, M. H. (1988). Three-year participation in circuit weight training improves muscular strength and self-efficacy in cardiac patients. *Journal of Cardiopulmonary Rehabilitation*, 8, 292-296.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th Ed). Toronto, ON: Pearson.
- Tiggemann, M. (2004). Body image across the adult lifespan: stability and change. *Body Image*, 1, 29-41.
- Tinetti, M.E. (2003). Clinical practice. Preventing falls in elderly persons. *New England Journal of Medicine*, 348, 42-49.
- Thompson, J.K., Heinberg, L.J., Altabe, M., & Tantleff-Dunn, S. (1999). *Exacting beauty: Theory, assessment and treatment of body image disturbance*. Washington, DC: American Psychological Association.
- Trautmann, J., Lokken Worthy, S., & Lokken, K.L. (2007). Body dissatisfaction, bulimic symptoms, and clothing practices among college women. *The Journal of Psychology: Interdisciplinary and Applied*, 141, 485-498.
- Turner, L.W., Faile, P.A., & Tomlinson, R. (1999). Osteoporosis diagnosis and fracture. *Orthopaedic Nursing*, 18, 21-27.
- Weyerer, S. & Kupfer, B. (1994). Physical exercise and psychological health. *Sports Medicine*, 17, 108-116.

- Whisenhunt, B. & Williamson, D. (2002). Perceived weight status in normal weight and overweight women. *Eating Behaviors, 3*, 229-238.
- White, C.A. (2002). Body images in oncology. In T.F. Cash & T. Pruzinsky (Eds.), *Body Image: A handbook of Theory, Research, and Clinical Practice* (pp. 379-386). New York: The Guilford Press.
- Williams Utz, S., Hammer, J., Miller Whitmire, V., & Grass, S. (1990). Perceptions of body image and health status in persons with mitral valve prolapse. *Journal of Nursing Scholarship, 22*, 18-22.
- Woodgate, J., Martin Ginis, K.A., & Sinden, A.R. (2007). Physical activity and social physique anxiety in older women: The moderating effects of self-presentation efficacy. *Journal of Applied Biobehavioral Research, 8*, 116-127.

Table 1

Demographic Characteristics of the Sample (N = 55)

Variable	Exercise		Non-Exercise	
	SRO (n = 12)	SRN (n = 17)	SRO (n = 10)	SRN (n = 16)
Age	60.92 (3.28)	60.40 (4.48)	61.86 (5.93)	61.81 (4.75)
Height (in cm)	160.98 (4.80)	163.08 (4.34)	160.94 (6.10)	162.55 (5.37)
Weight (in kg)	69.82 (9.82)	73.57 (15.34)	70.68 (12.64)	71.20 (11.51)
PA Baseline	2.27 (2.45)	3.4 (2.37)	3.45 (2.07)	2.78 (2.32)
PA 16-weeks	3.75 (.84)	3.79 (1.51)	2.90 (1.84)	2.84 (1.91)
Falls Baseline	0.46 (.88)	0.26 (.70)	0.38 (.77)	0.55 (1.15)
Falls 16-weeks	0.67 (.78)	0.59 (1.28)	0.33 (.70)	0.88 (1.50)

Note. SRO = Self-Report Osteoporosis; SRN = Self-Report Non-Osteoporosis; PA Baseline = Physical activity frequency at baseline; PA 16-weeks = Physical activity frequency at 16 weeks; Falls Baseline = number of falls in past year; Falls 16-weeks = number of falls in past year.

All p 's > .05

Table 2

Correlations for Exercise Group (n = 29) at Baseline for SRO and SRN Women

	AE	AO	FE	FO	HE	HO	IO	BASS	OP	SCW
AE	--	-.50*	.05	.19	.47*	.46*	-.41	.85**	-.55*	-
AO	-.10	--	-.08	-.23	-.40	-.38	.31	-.44	.60*	.15
FE	-.21	.24	--	.40	-.04	.26	.20	.14	.08	.29
FO	.16	.49	.62*	--	.32	.06	-.13	.32	-.24	.08
HE	.07	.59*	-.21	.16	--	.14	-.40	.43	-.37	-.23
HO	.34	.20	-.02	.29	.51	--	.32	.46*	-.04	-.43
IO	.39	.40	.10	.30	.58*	.88**	--	-.27	.36	.26
BASS	.69**	.28	-.12	.17	.15	.28	.42	--	-.48*	-
OP	-.36	.56*	.51	.37	-.20	-.31	-.18	-.11	--	.41
SCW	-.58*	-.02	.03	-.14	.05	-.26	-.14	-.45	.16	--

Note. SRO = below diagonal; SRN = above diagonal; AE = Appearance Evaluation; AO = Appearance Orientation; FE = Fitness Evaluation; FO = Fitness Orientation; HE = Health Evaluation; HO = Health Orientation; IO = Illness Orientation; BAS = Body Areas Satisfaction Scale; OP = Overweight Preoccupation; SCW = Self-Classified Weight.

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

Table 3

Correlations for Exercise Group (n = 29) at 16-weeks for SRO and SRN Women

	AE	AO	FE	FO	HE	HO	IO	BASS	OP	SCW
AE	--	-.06	.39	.30	.46	.52*	-.28	.74**	-.52*	-
AO	.23	--	.27	-.25	-.03	.01	.46	.01	.60*	-.20
FE	.26	.35	--	.41	.46	.45	.21	.42	-.34	-.16
FO	.31	.43	.92**	--	.51*	.57*	-.16	.54*	-.38	-.21
HE	.30	.17	.26	.30	--	.63**	-.12	.39	-.10	-.20
HO	.47	.17	.59*	.52	.05	--	.33	.55*	-.14	-.55*
IO	.20	-.03	.33	.35	.33	.69*	--	-.19	.48	-.12
BASS	.86**	.45	.48	.53	.46	.43	.15	--	-.43	-.60*
OP	-.47	.56	-.10	-.11	-.26	-.29	-.31	-.22	--	.22
SCW	-	-.34	-.17	-.14	-.27	-.29	-.07	-.80*	.30	--
	.82**									

Note. SRO = below diagonal; SRN = above diagonal; AE = Appearance Evaluation; AO = Appearance Orientation; FE = Fitness Evaluation; FO = Fitness Orientation; HE = Health Evaluation; HO = Health Orientation; IO = Illness Orientation; BAS = Body Areas Satisfaction Scale; OP = Overweight Preoccupation; SCW = Self-Classified Weight.

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

Table 4

Correlations for Non-Exercise (n = 26) Group at Baseline for SRO and SRN Women

	AE	AO	FE	FO	HE	HO	IO	BASS	OP	SCW
AE	--	.20	.30	.34	.11	.58**	.38	.65**	-.20	-
AO	.27	--	.31	.11	.43	.34	.34	-.08	.57**	.03
FE	.65*	.31	--	.53*	.44*	.45*	.40	.41	.05	-.28
FO	.65*	.42	.73**	--	.11	.52*	.29	.40	.26	-.18
HE	.59*	-.11	.42	.40	--	.12	.52*	-.03	.16	.04
HO	.09	-.03	-.08	-.15	.31	--	.71**	.33	.07	-.39
IO	-.02	.02	-.29	-.30	.38	.79**	--	.12	.18	-.23
BASS	.89**	.07	.60*	.53	.65*	.22	-.05	--	-.38	-
OP	-.57*	.29	-.27	-.06	-.32	-.08	-.11	-.56*	--	.49*
SCW	-.52	-.32	-.59	-.30	-.17	.25	.32	-.48	.31	--

Note. SRO = below diagonal; SRN = above diagonal; AE = Appearance Evaluation; AO = Appearance Orientation; FE = Fitness Evaluation; FO = Fitness Orientation; HE = Health Evaluation; HO = Health Orientation; IO = Illness Orientation; BAS = Body Areas Satisfaction Scale; OP = Overweight Preoccupation; SCW = Self-Classified Weight.

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

Table 5

Correlations for Non-Exercise Group (n = 26) at 16-weeks for SRO and SRN Women

	AE	AO	FE	FO	HE	HO	IO	BASS	OP	SCW
AE	--	.31	.23	.72**	.61*	.66**	.72**	.76**	-.25	-.42
AO	-.29	--	-.18	.13	.23	.31	.52*	.03	.45	.09
FE	.48	-.31	--	.34	.34	.08	.03	.29	-.30	-.18
FO	.37	-.52	.42	--	.31	.44	.49	.56*	-.05	-.19
HE	.64*	-.45	.07	.41	--	.37	.52	.35	-.26	.12
HO	.42	-.25	-.08	.48	.66*	--	.77*	.28	-.02	-.31
IO	-.02	.79**	.15	-.30	-.17	.01	--	.37	.26	.02
BASS	.76*	-.63	.61	.28	.67*	.24	-.24	--	-.50	-.34
OP	-.53	.57	-.51	-.06	-.31	-.18	.32	-.83**	--	.35
SCW	-.73*	.39	-.56	-.40	-.40	-.02	.25	-.70*	.55	--

Note. SRO = below diagonal; SRN = above diagonal; AE = Appearance Evaluation; AO = Appearance Orientation; FE = Fitness Evaluation; FO = Fitness Orientation; HE = Health Evaluation; HO = Health Orientation; IO = Illness Orientation; BAS = Body Areas Satisfaction Scale; OP = Overweight Preoccupation; SCW = Self-Classified Weight.

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

Table 6

MBSRQ Subscale Scores at Baseline by Osteoporosis Group

Variable	Mean (SD)	Mean (SD)
	SRN (n = 41)	SRO (n = 27)
AE	2.93 (.72)	3.33 (.78)
AO	3.64 (.45)	3.77 (.40)
FE	3.15 (.66)	3.27 (.96)
FO	3.28 (.57)	3.43 (.62)
HE	3.93 (.49)	3.80 (.65)
HO	3.79 (.60)	4.15 (.50)
IO	3.09 (.74)	3.45 (.81)
BASS	3.02 (.59)	3.31 (.61)
OP	2.76 (.75)	2.74 (.75)
SCW	3.75 (.75)	3.57 (.60)

Note. SRO = Self-Report Osteoporosis; SRN = Self-Report Non-Osteoporosis; Subscales range from 1 to 5. AE = Appearance Evaluation; AO = Appearance Orientation; FE = Fitness Evaluation; FO = Fitness Orientation; HE = Health Evaluation; HO = Health Orientation; IO = Illness Orientation; BASS = Body Areas Satisfaction Scale; OP = Overweight Preoccupation; SCW = Self-Classified Weight.

Table 7

Pre and Post MBSRQ Subscale Scores by Exercise and Osteoporosis Group

Variable	Exercise				Non-Exercise			
	SRO		SRN		SRO		SRN	
	Pre M (SD)	16-Week M (SD)						
AE	3.25 (.67)	3.38 (.81)	2.79 (.70)	3.15 (.74)	3.40 (.89)	3.37 (.66)	3.05 (.74)	3.05 (.59)
AO	3.70 (.34)	3.75 (.33)	3.61 (.43)	3.53 (.55)	3.85 (.45)	3.85 (.43)	3.67 (.46)	3.59 (.54)
FE	3.23 (.77)	3.33 (.96)	3.00 (.73)	3.06 (.95)	3.31 (1.13)	3.43 (.90)	3.29 (.57)	3.40 (.55)
FO	3.41 (.63)	3.70 (.64)	3.19 (.58)	3.71 (.51)	3.45 (.63)	3.51 (.45)	3.37 (.55)	3.23 (.50)
HE	3.96 (.70)	4.10 (.61)	3.97 (.55)	4.18 (.50)	3.65 (.59)	3.57 (.79)	3.90 (.44)	3.71 (.60)
HO	4.13 (.51)	4.30 (.53)	3.66 (.53)	3.98 (.39)	4.17 (.50)	4.11 (.43)	3.92 (.65)	3.80 (.49)
IO	3.22 (.96)	3.37 (.96)	2.93 (.70)	3.02 (.94)	3.67 (.60)	3.56 (.53)	3.25 (.76)	3.48 (.66)
BASS	3.17 (.38)	3.31 (.53)	2.97 (.54)	3.40 (.53)	3.44 (.76)	3.49 (.74)	3.08 (.64)	2.94 (.58)
OP	2.60 (.90)	2.54 (.49)	2.69 (.80)	2.42 (.80)	2.87 (.59)	2.60 (.81)	2.83 (.72)	2.77 (.81)
SCW	3.62 (.58)	3.65 (.51)	3.82 (.75)	3.63 (.72)	3.54 (.63)	3.70 (.48)	3.68 (.75)	3.51 (.67)

Note. SRO = Self-Report Osteoporosis; SRN = Self-Report Non-Osteoporosis; Subscales range from 1 to 5. AE = Appearance Evaluation; AO = Appearance Orientation; FE = Fitness Evaluation; FO = Fitness Orientation; HE = Health Evaluation; HO = Health Orientation; IO = Illness Orientation; BASS = Body Areas Satisfaction Scale; OP = Overweight Preoccupation; SCW = Self-Classified Weight.

Table 8

Pre and Post MBSRQ Subscale Scores by Exercise Group

Variable	Exercise Group (<i>n</i> = 29)		Non-Exercise Group (<i>n</i> = 26)	
	Pre	16-week	Pre	16-week
AE	3.09 (.65)	3.25 (.76)	3.38 (.69)	3.18 (.63)*
AO	3.60 (.36)	3.62 (.48)	3.82 (.48)	3.69 (.51)
FE	3.14 (.76)	3.17 (.95)	3.40 (.82)	3.41 (.69)
FO	3.28 (.64)	3.71 (.56)*	3.47 (.60)	3.33 (.49)
HE	3.97 (.60)	4.14 (.54)	3.82 (.52)	3.65 (.67)*
HO	3.90 (.49)	4.11 (.48)*	4.04 (.55)	3.92 (.48)*
IO	3.03 (.83)	3.17 (.95)	3.48 (.67)	3.51 (.60)
BASS	3.16 (.40)	3.36 (.52)*	3.30 (.65)	3.15 (.69)*
OP	2.59 (.79)	2.47 (.68)	2.81 (.62)	2.71 (.80)
SCW	3.66 (.64)	3.63 (.63)	3.55 (.69)	3.58 (.60)

Note. Standard deviations in parentheses. Subscales range from 1 to 5. AE = Appearance Evaluation; AO = Appearance Orientation; FE = Fitness Evaluation; FO = Fitness Orientation; HE = Health Evaluation; HO = Health Orientation; IO = Illness Orientation; BASS = Body Areas Satisfaction Scale; OP = Overweight Preoccupation; SCW = Self-Classified Weight.

* $p \leq .01$

Appendix A

Informed Consent

**Brock University, Faculty of Applied Health Sciences
Participation Consent Form**

Title of Study: Balance Confidence, Mobility, and Falls in Older Adults with Osteoporosis

Principle Investigator: Dr. Allan Adkin, Assistant Professor, Dept. of Physical Education & Kinesiology

Co-Investigators: Dr. Kimberley L. Gammage, Associate Professor, Dept. of Physical Education & Kinesiology; Dr. Nota Klentrou, Department Chair and Associate Professor, Dept. of Physical Education & Kinesiology

Name of Participant: (please print) _____

- I have been given a copy of, and have read, the letter of invitation provided to me by the Principal investigator conducting the research.
- I understand I am being invited to participate in research that involves examining the influence of an exercise program on balance performance, confidence, and body image in older adults with osteoporosis.
- I understand that I must be in good general health and free of any known conditions that relate to osteoporosis or affect the ability to safely perform the tests (e.g., rheumatoid arthritis, cardiovascular disease, neuromuscular disease, balance disorders, or fractures occurring less than 8 weeks from programs start, or drug-therapies that affect bone metabolism).
- I understand this research is being conducted at Brock University.
- I understand that participation will involve random assignment of participation into one of two groups. One group will participate in three- 3 hour sessions of balance and gait tests, strength tests, and questionnaire regarding fall history, balance confidence, body image, and quality of life. The second group will participate in the previously mentioned sessions that group 1 will participate in, with the addition to a 16-week exercise intervention. The exercise intervention will consist of cardiovascular, strength, flexibility and balance training. The intervention will take place three times weekly for approximately 1 hour in duration. I may be asked to participate in a focus group.
- I understand that I have the opportunity to receive information regarding my ability to balance under different conditions.
- I understand that there are minimal physical risks associated with performing physical activity within the study.
- I understand that participation in the exercise intervention may result in muscle fatigue and muscle soreness.
- I understand there are minimal psychological risks and that I may experience some discomfort due to the nature of the questions being asked.
- I understand that there is no obligation to answer any question that I feel is invasive, offensive or inappropriate.
- I understand that I may ask questions of the researchers at any point during the research process.
- I understand that my participation in this study is voluntary and that I may withdraw from the study at any time for any reason without penalty.
- I understand that I will receive no compensation for my participation in baseline testing.
- I understand that the exercise intervention will take place in a group setting, with other older adults aged 50 and older.
- I understand that only the principal and co-investigators and their research assistants will have access to the data and that data will be kept in a locked laboratory and Brock University and will be destroyed three years following publication of the study.
- I understand that, upon request, I will receive a summary of the results.
- I understand that the results of this study may be submitted in academic journal articles and conference presentations.
- As indicated by my signature below, I acknowledge that I have read and understand the relevant information, and I am participating freely and willingly and I am providing my consent.
- I understand that if I have any further questions concerning the study I may contact Dr. Allan Adkin at (905) 688-5550 extension 4990 or by email at Allan.Adkin@brocku.ca or Dr. Kimberley L. Gammage at (905) 688-5550 extension 3772 or by email at kgammage@brocku.ca or Dr. Nota Klentrou at (905) 688-5550 extension 4538 or by email at nota.klentrou@brocku.ca.
- Additionally, concerns about my involvement in the study may also be directed to the Research Ethics Officers in the Office of Research Services at (905) 688-5550 extension 3035.

Signature of Participant: _____

Date: _____

Signature of Researcher: _____

Date: _____

Thank you for your participation. Please retain a copy of this form for your records.

This project has been reviewed by, and received ethics clearance through the Office of Research Ethics Board, (File #-05-345).

Appendix B
Questionnaires

Form 3.1

**The Health/Activity Questionnaire Used in the
FallProof! Program**

Date _____

Name _____ Address _____

City _____ State _____ Zip _____

Home Phone # _____ Gender: Male _____ Female _____

Age _____ Year of birth _____ Height _____ Weight _____

Ethnicity _____ Highest level of education completed _____

Whom to contact in a case of emergency _____ Phone # _____

Name of your physician _____ Phone # _____

1. Have you ever been diagnosed as having any of the following conditions?

	Yes (X)	Year of onset (approximate)
Heart attack	<input type="checkbox"/>	_____
Transient ischemic attack	<input type="checkbox"/>	_____
Angina (chest pain)	<input type="checkbox"/>	_____
High blood pressure	<input type="checkbox"/>	_____
Stroke	<input type="checkbox"/>	_____
Peripheral vascular disease	<input type="checkbox"/>	_____
Diabetes	<input type="checkbox"/>	_____
Neuropathies (problems with sensations)	<input type="checkbox"/>	_____
Respiratory disease	<input type="checkbox"/>	_____
Parkinson's disease	<input type="checkbox"/>	_____
Multiple sclerosis	<input type="checkbox"/>	_____
Polio/post polio syndrome	<input type="checkbox"/>	_____
Epilepsy/seizures	<input type="checkbox"/>	_____
Other neurological conditions	<input type="checkbox"/>	_____
Osteoporosis	<input type="checkbox"/>	_____
Rheumatoid arthritis	<input type="checkbox"/>	_____
Other arthritic conditions	<input type="checkbox"/>	_____
Visual/depth perception problems	<input type="checkbox"/>	_____
Inner ear problems/recurrent ear infections	<input type="checkbox"/>	_____
Cerebellar problems (ataxia)	<input type="checkbox"/>	_____
Other movement disorders	<input type="checkbox"/>	_____
Chemical dependency (alcohol and/or drugs)	<input type="checkbox"/>	_____
Depression	<input type="checkbox"/>	_____

(continued)

Reprinted from the Center for Successful Aging at California State University, Fullerton. Question 18 reprinted from Rikli & Jones, 1999.

Falls and Physical Activity Question from the Health/Activity Questionnaire

How many times have you fallen within the past year? _____

Did you require medical treatment? YES or NO

If you answered YES to either question, please list the approximate date of the fall, the medical treatment required, and the reason you fell in each case, (e.g., uneven surface, going down stairs).

Do you currently participate in regular physical exercise (such as walking, sports, exercise classes, housework, or yard work) that is strenuous to cause a noticeable increase in breathing, heart rate, or perspiration? YES or NO

If yes, how many days per week? (circle)

One Two Three Four Five Six Seven

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

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

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

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

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

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

If
you
answered

YES to one or more questions

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

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

NO to all questions

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

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

DELAY BECOMING MUCH MORE ACTIVE:

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

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

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

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

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

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

NAME _____

SIGNATURE _____

DATE _____

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

WITNESS _____

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



© Canadian Society for Exercise Physiology

Supported by:



Health
Canada

Santé
Canada

continued on other side...

THE MBSRQ
INSTRUCTIONS--PLEASE READ CAREFULLY

The following pages contain a series of statements about how people might think, feel, or behave. You are asked to indicate the extent to which each statement pertains to you personally.

Your answers to the items in the questionnaire are anonymous, so please do not write your name on any of the materials. In order to complete the questionnaire, read each statement carefully and decide how much it pertains to you personally. Using a scale like the one below, indicate your answer by entering it to the left of the number of the statement.

EXAMPLE:

_____ I am usually in a good mood.

In the blank space,
 enter a **1** if you **definitely disagree** with the statement;
 enter a **2** if you **mostly disagree**;
 enter a **3** if you **neither agree nor disagree**;
 enter a **4** if you **mostly agree**;
 or enter a **5** if you **definitely agree** with the statement.

There are no right or wrong answers. Just give the answer that is most accurate for you. Remember, your responses are confidential, so please be completely honest and answer all items.

1	2	3	4	5
Definitely Disagree	Mostly Disagree	Neither Agree Nor Disagree	Mostly Agree	Definitely Agree

- _____ 1. Before going out in public, I always notice how I look.
- _____ 2. I am careful to buy clothes that will make me look my best.
- _____ 3. I would pass most physical-fitness tests.
- _____ 4. It is important that I have superior physical strength.
- _____ 5. My body is sexually appealing.
- _____ 6. I am not involved in a regular exercise program.
- _____ 7. I am in control of my health.
- _____ 8. I know a lot about things that affect my physical health.

- _____ 9. I have deliberately developed a healthy lifestyle.
- _____ 10. I constantly worry about being or becoming fat.
- _____ 11. I like my looks just the way they are.
- _____ 12. I check my appearance in a mirror whenever I can.
- _____ 13. Before going out, I usually spend a lot of time getting ready.
- _____ 14. My physical endurance is good.
- _____ 15. Participating in sports is unimportant to me.
- _____ 16. I do not actively do things to keep physically fit.
- _____ 17. My health is a matter of unexpected ups and downs.
- _____ 18. Good health is one of the most important things in my life.
- _____ 19. I don't do anything that I know might threaten my health.
- _____ 20. I am very conscious of even small changes in my weight.
- _____ 21. Most people would consider me good-looking.
- _____ 22. It is important that I always look good.
- _____ 23. I use very few grooming products.
- _____ 24. I easily learn physical skills.
- _____ 25. Being physically fit is not a strong priority in my life.
- _____ 26. I do things to increase my physical strength.
- _____ 27. I am seldom physically ill.
- _____ 28. I take my health for granted.
- _____ 29. I often read books and magazines that pertain to health.
- _____ 30. I like the way I look without my clothes on.
- _____ 31. I am self-conscious if my grooming isn't right.
- _____ 32. I usually wear whatever is handy without caring how it looks.
- _____ 33. I do poorly in physical sports or games.
- _____ 34. I seldom think about my athletic skills.
- _____ 35. I work to improve my physical stamina.
- _____ 36. From day to day, I never know how my body will feel.
- _____ 37. If I am sick, I don't pay much attention to my symptoms.
- _____ 38. I make no special effort to eat a balanced and nutritious diet.
- _____ 39. I like the way my clothes fit me.

- _____ 40. I don't care what people think about my appearance.
- _____ 41. I take special care with my hair grooming.
- _____ 42. I dislike my physique.
- _____ 43. I don't care to improve my abilities in physical activities.
- _____ 44. I try to be physically active.
- _____ 45. I often feel vulnerable to sickness.
- _____ 46. I pay close attention to my body for any signs of illness.
- _____ 47. If I'm coming down with a cold or flu, I just ignore it and go on as usual.
- _____ 48. I am physically unattractive.
- _____ 49. I never think about my appearance.
- _____ 50. I am always trying to improve my physical appearance.
- _____ 51. I am very well coordinated.
- _____ 52. I know a lot about physical fitness.
- _____ 53. I play a sport regularly throughout the year.
- _____ 54. I am a physically healthy person.
- _____ 55. I am very aware of small changes in my physical health.
- _____ 56. At the first sign of illness, I seek medical advice.
- _____ 57. I am on a weight-loss diet.

For the remainder of the items use the response scale given with the item, and enter your answer in the space beside the item.

- _____ 58. I have tried to lose weight by fasting or going on crash diets.

1. Never
2. Rarely
3. Sometimes
4. Often
5. Very Often

- _____ 59. I think I am:

1. Very Underweight
2. Somewhat Underweight
3. Normal Weight
4. Somewhat Overweight

5. Very Overweight

_____ 60. From looking at me, most other people would think I am:

- 1. Very Underweight
- 2. Somewhat Underweight
- 3. Normal Weight
- 4. Somewhat Overweight
- 5. Very Overweight

61-69. Use this 1 to 5 scale to indicate how dissatisfied or satisfied you are with each of the following areas or aspects of your body:

1	2	3	4	5
Very Dissatisfied	Mostly Dissatisfied	Neither Satisfied nor Dissatisfied	Mostly Satisfied	Very Satisfied

- _____ 61. Face (facial features, complexion)
- _____ 62. Hair (color, thickness, texture)
- _____ 63. Lower torso (buttocks, hips, thighs, legs)
- _____ 64. Mid torso (waist, stomach)
- _____ 65. Upper torso (chest or breasts, shoulders, arms)
- _____ 66. Muscle tone
- _____ 67. Weight
- _____ 68. Height
- _____ 69. Overall appearance

Appendix C

Ethics Clearance

From: Research Ethics Board [mailto:reb@brocku.ca]
Sent: Tuesday, August 01, 2006 1:12 PM
To: allan.adkin@brocku.ca; Kimberley Gammage; Panagiota Klentrou;
 mm01cf@badger.ac.brocku.ca
Cc: mowen@brocku.ca; linda rose-krasnor
Subject: REB 05-345 ADKIN - Approved

DATE: August 1, 2006

FROM: Linda Rose-Krasnor, Chair
 Research Ethics Board (REB)

TO: Allan Adkin, PEKN
 Kim Gammage,
 Nota Klentrou,
 Michael Moore

FILE: 05-345 ADKIN

TITLE: Balance confidence, mobility and falls in older women with osteoporosis

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

DECISION: Accepted as clarified.

This project has received ethics clearance for the period of August 1, 2006 to April 30, 2008 subject to full REB ratification at the Research Ethics Board's next scheduled meeting. The clearance period may be extended upon request. ***The study may now proceed.***

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

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

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

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

Please quote your REB file number on all future correspondence.

LRK/bb

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

Appendix D

Recruitment Poster

OSTEOPOROSIS RESEARCH STUDY

PURPOSE:

- To evaluate the effectiveness of a physical activity program to improve balance confidence, body image, and mobility in order to reduce fall risk in women with osteoporosis.

REQUIREMENTS:

- Females 55 years of age or older
- No known musculoskeletal or neurological diagnoses.
- Participants will be randomly assigned to either:
 - Three 3-hour testing sessions over 16 weeks at sign-up, midpoint and conclusion of study.
 - OR
 - Involvement in a 16-week exercise intervention 3 times weekly for a 1-hour duration, plus three 3-hour testing sessions.
- Perform balance tests with varying levels of difficulty.
- Perform muscle strength tests for the lower extremities.
- Respond to questionnaires regarding balance confidence, fall history, and body image.

BENEFITS:

- Research may aid in reducing falls in women with osteoporosis.
- Study will determine the effectiveness of balance exercise interventions.
- Research will further the understanding of the effects of osteoporosis on balance confidence, body image, and mobility.

If interested, please contact:

Dr. Kimberley Gammage at (905) 688-5550 ext: 3772

Or

Dr. Allan Adkin at (905) 688-5550 ext: 4990

This study has been reviewed and received ethics clearance through the **REB (File #05-345)**. For answers to pertinent questions about research participant's right, please contact the Research Ethics Office at 905-688-5550 ext. 3035, reb@brocku.ca

Appendix E

Participant Logbook Sheet

CARDIOVASCULAR EXERCISES (20-30 MINUTES)

Date:							
Equipment:							
Cardio Time:							
Resistance:							

STRENGTH EXERCISES

Muscle	Exercise	Weight	Reps	Done	Done	Done	Done	Done	Done
Upper Back	Seated row								
Chest	Seated chest press								
Quads	Seated leg press								
Calves	Seated calf raise								
Triceps	Tricep pressdown								
Biceps	Bicep curl								
Shoulders	Lateral arm raise								
Legs	Wall squat with ball								

BALANCE/CORE STRENGTHENING

Exercise	Equipment/Position	Reps	Done	Done	Done	Done	Done	Done
Abdominal	Seated isometric contraction (10 seconds)							
Obliques	Seated twist (slow)							
Superman (low back)	Opposite arm-leg raise							
Leaning (stability)	3 (front-back; side-side)							
Balance Pod Walking	2 cycles							

STRETCHING (10-20 seconds, 2 sets each muscle group) Put a check mark each time you complete the stretch.

Biceps: _____ Triceps: _____ Shoulders: _____ Back: _____ Chest: _____
 Gluts: _____ Quadriceps: _____ Calves: _____ Hip Flexors: _____ Hamstrings: _____
 _____ Low Back: _____