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Exercise and Self Esteem in Breast Cancer Survivors:
An Application of the Exercise and Self Esteem Model

by

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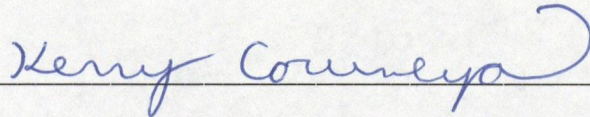
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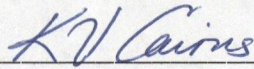
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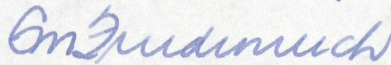
The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Exercise and Self Esteem in Breast Cancer Survivors: An Application of the Exercise and Self Esteem Model" submitted by Margaret Kjerstin Baldwin in partial fulfillment of the requirements for the degree of Master of Science.



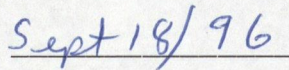
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Abstract

The purpose of this exploratory, retrospective study was to use the Exercise and Self Esteem Model as a framework to examine the relationships among exercise participation, body image, physical self efficacy, and self esteem in women who have been treated for breast cancer. Participants were sixty-four female volunteers from four breast cancer support groups. Statistical analysis showed that strenuous exercise, physical self efficacy, perceived physical abilities, and self esteem were significantly related. Body image correlated with perceived physical abilities, physical self presentation confidence, physical self efficacy, and self esteem, but not exercise participation. Strenuous exercise was not found to be significantly more related to perceived physical abilities than self esteem although it did approach significance. Perceived physical abilities and body image also mediated the effect of strenuous exercise on self esteem. Support was generally found for the potential role of exercise in psychological recovery from breast cancer.

Acknowledgments

I would like to extend my appreciation to my friends, particularly Neil, and my family for their ongoing encouragement and patience throughout my Masters degree. I would also like to especially thank my supervisor, Dr. Kerry Courneya, for his guidance and support.

Dedication

I would like to dedicate this research to the breast cancer survivors. Thank you for sharing your personal experiences.

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Chapter 1

Introduction

Breast cancer is estimated to affect one in nine Canadian women over their lifetime with one in twenty-four women ultimately dying from it (National Cancer Institute of Canada, 1995). These ratios translate into 17 700 estimated new breast cancer cases and 5400 estimated deaths in 1995. As well, breast cancer has the highest rate of cancer incidence (30%), and is second (19%) to lung cancer for mortality rates in women (National Cancer Institute of Canada, 1995). Breast cancer incidence and mortality rates are similar in American women. In 1990, the estimated breast cancer incidence was 29% of all cancers while the estimated mortality rate was 18% after lung cancer in the US (Silverberg et al, 1990). Breast cancer mortality has remained stable over the last decade with a -0.1 annual percent change between 1983-1992. The incidence of breast cancer cases, however, has risen somewhat at an annual rate of 1.3% change over the same time span (National Cancer Institute of Canada, 1995). According to the National Cancer Institute of Canada (1995), this slight increase may be attributable to use of mammography as breast cancer screening method. There is also an increased chance of women being diagnosed with breast cancer as they get older although breast cancer is quite frequent at earlier ages. About one third of cases occur in women between 40-59 years with another third in women over 70 years old (National Cancer Institute of Canada, 1995).

Impact of Breast Cancer Diagnosis and Treatment

More women are, therefore, being diagnosed and living with breast cancer. Consequently, much research has focused on the psychosocial outcomes of breast cancer diagnosis and treatment (Ganz et al, 1992; Glanz & Lerman, 1992; Hall & Fallowfield, 1989; Kiebert et al, 1991; Margolis et al, 1990;

Meyerowitz, 1980; Penman et al, 1987; Polivy, 1977; Steinberg et al, 1985; Taylor et al, 1984 ; Wellisch et al, 1989). Changes in self esteem and self concept (Foltz, 1987; Hopwood & Maguire, 1988; Penman et al, 1987; Schain, 1976; Schain, 1988), body image and female self image (Polivy, 1977; Schain, 1976; Schain, 1988, Steinberg et al, 1985; Meyerowitz, 1980; Mock, 1993), and sexual attractiveness, desirability, and relationships (Margolis et al, 1990; Schain, 1976; Schain, 1988; Schover, 1991; Steinberg et al, 1985) as well as increases in psychological morbidity (Glanz & Lerman, 1992), social isolation and misunderstanding (Vachon & Lyall, 1976) are some psychosocial issues faced by women diagnosed and treated with breast cancer. As well, depression, anxiety, hostility, and anger are some of the emotional reactions to treatment (Meyerowitz, 1980; Vachon & Lyall, 1976). In counselling, women with breast cancer also deal with issues related to mortality, physical rehabilitation, breast prostheses, treatment side effects, financial concerns, and employment as well as the previously mentioned psychosocial issues (Schain, 1976).

An underlying assumption of self esteem studies in cancer research is that cancer and cancer treatment are powerful stressors that can have potentially adverse effects on self esteem (Curbow & Somerfield, 1991). Self esteem has been defined as the degree to which individuals feel positive about themselves, and is regarded as the evaluative aspect of self concept (Sonstroem & Morgan, 1989).

Age and elapsed time since treatment, in particular, appear to influence self esteem levels (Penman et al, 1987). In addition, weight gain in breast cancer patients being treated with adjuvant chemotherapy is common, and its negative effects on women's self esteem, in general, are apparent by feelings of inadequacy and insecurity (Winningham et al, 1989; Wooley et al, 1979).

Reported links between body image satisfaction and self concept in women treated for breast cancer also suggest a potential impact of treatment on self esteem levels (Foltz, 1987; Mock, 1993). However, the actual incidence, magnitude, and duration of self esteem and self concept change associated with cancer and cancer treatment are also influenced by a number of factors including type of treatment and rehabilitation, stage of disease, perceived social support and personal control, and individual and sociocultural perceptions (Curbow & Somerfield, 1991; Feather & Wainstock, 1989; Foltz, 1987; Glanz & Lerman, 1992; Mock, 1993; Penman et al, 1987; Taylor et al, 1984).

There are some inconsistent research results regarding the influence of breast cancer on self esteem. The findings using comparison groups, for example, to assess self esteem changes were generally non-significant (Curbow & Somerfield, 1991; Nelson, 1991; Penman et al, 1987). However, a review article examining the use of the Rosenberg Self Esteem (RSE) Scale with adult cancer patients pointed out several methodological differences in the studies that may be contributing to these varied results (Curbow & Somerfield, 1991). In particular, the use of a global measure of self esteem, by itself, may not sufficiently detect sensitive changes or differences in areas related to specific cancers and treatments (Curbow & Somerfield, 1991). Global self esteem tends to be more stable and less susceptible to change whereas specific components of esteem may be more variable. Curbow & Somerfield (1991) recommend using a combination of global measures and specific measures that address aspects of self that may be more affected by cancer and its treatment.

Women's body image has repeatedly been reported as having suffered from breast cancer treatment (Ganz et al, 1992; Glanz & Lerman, 1992; Hall & Fallowfield, 1989; Kiebert et al, 1991; Margolis et al, 1990; Mock, 1993; Penman

et al, 1987; Polivy, 1977; Schain, 1976; Wellisch et al, 1989). Body image can be defined as "an individual's appraisal of and feelings about their body and its function" (Cornwell & Schmitt, 1990). It includes attitudes and perceptions regarding physical appearance, state of health, skills, and sexuality (Roid & Fitts, 1988). It is also an integral component of self concept and self esteem (Fox & Corbin, 1989; Mock, 1993).

It is not surprising that body image dissatisfaction is linked with breast cancer treatment considering the societal importance placed on female appearance in western culture (Seid, 1989; Schain, 1976; Tinning, 1985; Wolf, 1991) and the symbolic importance of the female breast (Hall & Fallowfield, 1989). Women are societally conditioned to believe that their value lies in their physical appearance (Seid, 1989; Schain, 1976), and the female breast, in particular, is powerfully linked with femininity, nurturing, and sex (Hall & Fallowfield, 1989; Mock, 1993). It becomes easy to understand the impact that the potential loss of a breast could have on the psychological recovery of women being treated for breast cancer.

A progressive loss of physical and functional capacity is often common among cancer patients (MacVicar et al, 1990; Winningham, 1991; Winningham et al, 1986; Winningham & MacVicar, 1988), and could also influence women's attitudes and perceptions of their bodies. Decreases in muscle strength and endurance, decreased appetite, and increased fatigue, nausea and diarrhea as well as changes in body weight and composition are several consequences of cancer and its treatment (MacVicar et al, 1990; Winningham & MacVicar, 1988; Winningham et al, 1989; Winningham et al, 1986). As well, decreased participation in daily physical activities contributes to this gradual loss of physical and functional capacity (Winningham, 1991).

Perceived physical confidence and competence could, therefore, be threatened by diminished physical and functional capacity as well as body image dissatisfaction. Bandura's self efficacy construct encompasses both competence and confidence issues (Bandura, 1991; Sonstroem & Morgan, 1989). Self efficacy is defined as the level and strength of a belief that a given activity can be successfully performed, and has been linked with physical self concept and global self esteem (Bandura, 1991; Sonstroem, 1984; Shavelson et al, 1976). As well, self efficacy expectations influence choice of activities and settings, and the amount of effort and persistence for an activity (Bandura, 1991; Sonstroem & Morgan, 1989). Therefore, physical self efficacy may also be an issue of concern for women being treated for breast cancer.

Interventions

A range of psychological interventions are currently being used to address the psychosocial consequences of cancer diagnosis and treatment. A recent meta-analysis examining the effectiveness of cognitive-behavioural interventions, informational and educational treatments, non-behavioural counselling, psychotherapy interventions, social support, and unusual treatments, such as music therapy, found significant differences between effect sizes of treatment-control comparisons and between treatment categories (Meyer & Mark, 1995).

Other reviews have also found a variety of psychological interventions to be effective for reducing emotional distress, enhancing coping, and improving adjustment in cancer patients depending on diagnosis and prognosis (Anderson, 1992; Fawzy et al, 1995). Exercise, in particular, has been found to potentially improve physical and functional capacity, and has been linked with higher self esteem and quality of life in breast cancer survivors (MacVicar & Winningham, 1986; MacVicar et al, 1990; Mock et al, 1994; Molinaro et al, 1986;

Nelson, 1991; Winningham & MacVicar, 1988; Young-McCaughan & Sexton, 1991).

Exercise and Breast Cancer

A variety of benefits have been attributed to regular physical activity in both healthy and diseased populations (Blumenthal et al, 1982; Crew & Landers, 1987; International Society of Sport Society, 1992; McAuley, 1994; McAuley et al, 1991; Moore, 1993; Naughton, 1992; North et al, 1990; Wilfley & Kunce, 1986). Reduced psychosocial stress response (Crew & Landers, 1987), stress levels (Wilfley & Kunce, 1986), and Type A behaviours (Blumenthal et al, 1980) have been found with exercise participation. It can also improve personal self efficacy (McAuley et al, 1991), mood states, quality of life, and concentration levels, and reduce confusion (Moore, 1993). Exercise can also be an effective anti-depressant, especially for individuals in medical rehabilitation for post-myocardial infarction, high cardiovascular risk, pulmonary, and hemodialysis (North et al, 1990).

The relationships between body image or satisfaction, self-esteem, and self-concept issues with exercise have also been well documented in healthy populations (Caruso & Gill, 1992; Eide, 1982; King et al, 1989; Marsh & Redmayne, 1994; Sonstroem, 1984; Sonstroem et al, 1993; Wilfley & Kunce, 1986). In particular, exercise participation has been found to enhance physical self perceptions, body satisfaction, and fitness which are also related to overall physical self worth, physical self concept, and global self concept (Caruso & Gill, 1992; Eide, 1982; Lafavi, 1991; Marsh & Redmayne, 1994; Moore, 1993; Wilfley & Kunce, 1986). As well, physical measures of exercise are associated with increases in participants' self esteem scores (Sonstroem, 1984; Sonstroem et al, 1991; Sonstroem et al, 1994).

The demonstrated physical benefits of regular physical activity also includes a decrease in systolic blood pressure, heart rate, and myocardial oxygen cost at rest and while performing submaximal work, increased level of physical work capacity, reduction in plasma triglycerides, and reduction in percentage body fat with concomitant increases in muscle mass (Naughton, 1992). Regularly performed physical activity by coronary artery diseased patients is also associated with mortality reductions from all cardiovascular causes except sudden death (Naughton, 1992).

Moderate aerobic activity during breast cancer treatment may also be beneficial for potentially controlling nausea and weight gain resulting from chemotherapy, in promoting physical well-being, and reducing fatigue (Winningham et al, 1989; Winningham & MacVicar, 1988; MacVicar & Winningham, 1986; Mock et al, 1994; Molinaro et al, 1986). Exercising has also been found to potentially decrease mood disturbance (MacVicar & Winningham, 1986), and is significantly related to adjustment to breast cancer (Taylor et al, 1984).

Other possible psychological benefits for breast cancer survivors who exercise have been reported. Young-McCaughan & Sexton (1991) found that exercisers with breast cancer have a higher quality of life and experienced fewer perceived barriers to exercise. Nelson (1991) found that women with breast cancer who exhibited more health promoting behaviours, such as physical activity, had higher rates of self-esteem. She attributed this trend to the possibility of an increased sense of personal control and well-being among the exercisers. As well, body satisfaction scores for women participating in an exercise and support group rehabilitation program did not decrease as they did for women receiving usual care (Mock et al 1994).

Several limitations from the reviewed literature on exercise and breast cancer exist. Firstly, there is limited research looking at the role of exercise on psychological variables within a breast cancer population (Nelson, 1991; MacVicar & Winningham, 1986; Mock et al, 1994; Young-McCaughan Sexton, 1991). Secondly, no breast cancer research has been found that specifically examined the relationships between exercise participation, body image, physical self-efficacy, and self-esteem in a single study despite the reported effects of breast cancer and its treatment on each area. This information would be especially useful for assessing the potential inclusion of cost-effective exercise programs as part of psychological as well as physical rehabilitation. Thirdly, global self esteem is a stable construct that is less susceptible to change whereas specific components of esteem may be more variable. Multiple components of self concept were examined by Mock et al (1994), but other reviewed research generally did not consider both global and specific self esteem components. Fourthly, there is limited use of theoretical frameworks in studies examining exercise and breast cancer (Mock et al, 1994; Nelson, 1991). In particular, exercise participation, body image, physical self efficacy, and self esteem have not been examined using a theoretical framework within a breast cancer population.

Exercise and Self Esteem Model

The Exercise and Self Esteem Model (EXSEM) (Sonstroem & Morgan, 1989; Sonstroem et al, 1991; Sonstroem et al, 1993; Sonstroem et al, 1994) provided the theoretical framework for this study. Essentially, EXSEM is a hierarchical model that depicts a link between exercise and self esteem (see Figure 1). The model is grounded in research that emphasizes specific multiple components of self structure. These components are based on perceived competencies in particular spheres rather than global constructs (Sonstroem &

Morgan, 1989). All the self components in this model have previously been shown to relate to exercise (Sonstroem & Morgan, 1989). As well, the model is organized hierarchically with lower levels more situationally-based, and influenced by behaviour and environment. Higher levels are more stable and related to global self esteem.

Insert Figure 1 about here

The original EXSEM included the variables of physical self-efficacy, physical competence, and physical acceptance as mediators between objective physical measures and global self esteem (Sonstroem & Morgan, 1989). The model hypothesized that measures of specific physical tasks would directly influence each related task self efficacy. This specific self-efficacy, in turn, would affect more general physical competence which then would influence both physical acceptance and global self esteem. Physical acceptance would also contribute to self esteem.

Variations on this model have been examined several times using different populations. The competence dimension, in particular, has been modified and examined with cardiac patients (Sonstroem et al, 1991), community fitness participants (Sonstroem et al, 1991), interscholastic swimmers (Sonstroem et al, 1993), and female aerobic dancers (Sonstroem et al, 1994). Generally, results indicated that global self esteem can be influenced by a generalization of competence that originated with physical self efficacies specific to a particular exercise activity.

Purpose

The purpose of this exploratory study is to use the Exercise and Self Esteem Model as a framework to examine the relationships among exercise

participation, body image, physical self-efficacy, and self-esteem in women who have been treated for breast cancer.

This study was based on the original model of Exercise and Self Esteem because it was more appropriate for assessing a breast cancer population. The inclusion of both physical competence and physical acceptance as mediating variables in this model was consistent with the reported influence of breast cancer treatment on body image, and functional and physical capacity. Furthermore, the focus of the study was on self-reported exercise participation in general, and not a specific sport skill or exercise activity. There was not, therefore, a specific measure of a physical skill and its related physical self efficacy. However, general measures of the physical competence and physical acceptance dimensions were included as well as a measure of general exercise participation and global self esteem. The use of this model attempted to address Curbow and Somerfield's (1991) recommendation to include both a global measure of self esteem and specific measures of self that may be affected by breast cancer and its treatment.

Study Hypotheses

Based on the Exercise and Self Esteem Model as well as previous breast cancer research, this study proposed that perceived physical competence can be generalized from exercise participation, and can in turn, influence physical acceptance. Both variables then contribute to global self esteem. Specifically, the study hypotheses are as follows:

- 1) Exercise participation, physical competence, physical acceptance, and global self esteem will be positively correlated.
- 2) Exercise participation will be more highly correlated with physical competence than physical acceptance or global self esteem.

3) Physical competence and physical acceptance will mediate the effect of exercise participation on global self esteem.

Chapter 2

Literature Review

Breast cancer incidence and mortality affects the lives of many women in Canada (National Cancer Institute of Canada, 1995). The psychosocial consequences of diagnosis and treatment have been well documented (Ganz et al, 1992; Glanz & Lerman, 1992; Hall & Fallowfield, 1989; Kiebert et al, 1991) as well as the current interventions used to address this psychosocial sequelae (Anderson, 1992; Fawzy et al, 1995; Meyer & Mark, 1995). However, several areas of research require more examination to assess better their potential roles in coping with and rehabilitating from breast cancer. The following literature review will further examine the effects of breast cancer on self esteem and self concept. It will also review the current research on the potential benefits of exercise for women diagnosed and treated for breast cancer. As well, the Exercise and Self Esteem model, used as the theoretical framework for this study, will be discussed further.

Self Esteem, Self Concept, and Breast Cancer

Cancer and cancer treatment are perceived as powerful stressors that can potentially have adverse effects on self esteem and self concept. These stressors are mediated by numerous factors that impact the actual incidence, magnitude, and duration of self esteem and self concept change (Curbow & Somerfield, 1991; Feather & Wainstock, 1989; Foltz, 1987; Glanz & Lerman, 1992; Mock, 1993; Penman et al, 1987; Taylor et al, 1984).

A combined cross sectional and longitudinal study with repeated measures was completed by the National Cancer Institute in the United States to assess the impact of mastectomy on self concept and social function (Penman et al, 1987). The longitudinal study took place over 12 months with 412 participants being assessed four times. The cross sectional component of

the study used a different sample at each time interval ($n = 1715$). A variety of instruments were used including the Rosenberg Self Esteem Scale.

A trend towards decreased self esteem was found for the mastectomy + adjuvant therapy group (Penman et al, 1987). It showed lower self esteem at the end of the year than at the initial assessment. These findings raise the possibility of significant psychological sequelae appearing after a longer period of time (Penman et al, 1987). As well, women in their 30s had significantly lower self esteem than women in their 40s, 50s, and 60s (Penman et al, 1987). The results also found significant predictors of lower self esteem for women across all age groups. These predictors included perceived lack of social support, locus of control, and magnitude of life change stress during a preceding three month period (Penman et al, 1987).

Some inconsistent research results exist regarding the influence of breast cancer on self esteem. The findings from studies that used comparison groups, for example, to assess self esteem changes were generally non-significant (Curbow & Somerfield, 1991; Nelson, 1991; Penman et al, 1987). Nelson's (1991) study found no significant differences in self-esteem between women with Stage I breast cancer treated with a modified radical mastectomy and a matched cohort of women without breast cancer.

A review article examining the use of the Rosenberg Self Esteem (RSE) Scale with adult cancer patients delineated several methodological differences between these studies that may be contributing to the varied results (Curbow & Somerfield, 1991). It was suggested that the use of a global measure of self esteem may not be sensitive enough to measure subtle individual changes or address the particular aspects of self that are most vulnerable to changing circumstances (Curbow & Somerfield, 1991). A combination of standard global measures and measures that address specific aspects of self particularly

affected by cancer or cancer treatment was recommended (Curbow & Somerfield, 1991).

This review article was also concerned that the use of a global measure of self esteem may be masking differences between cancer patients and other groups (Curbow & Somerfield, 1991). As well, it found that many of the reviewed studies did not report descriptive statistics on the self esteem scores. Comparisons across studies and between cancer populations is then more difficult. Consistent scoring methods for the Rosenberg Self Esteem Scale were also not reported across the reviewed studies making comparisons impossible (Curbow & Somerfield, 1991).

Breast cancer treatment also has an impact on women's body image (Ganz et al, 1992; Hall & Fallowfield, 1989; Kiebert et al, 1991). Amputation of the breast was the treatment of choice for many years (Hall & Fallowfield, 1989), and much research has focused on the post treatment psychological distress and adjustment resulting from this radical surgery (Ganz et al, 1992; Kiebert et al, 1991; Margolis et al, 1990; Penman et al, 1987; Polivy, 1977; Steinberg et al, 1985; Wellisch et al, 1989). Consequently, breast conserving treatment became highly supported as an effective alternate treatment for some women with breast cancer (Glanz & Lerman, 1992; Hall & Fallowfield, 1989).

Reviews have since compared breast conserving treatments and mastectomies, and some have shown no substantial differences in changes of life patterns or psychological morbidity (Ganz et al, 1992; Glanz & Lerman, 1992; Kiebert et al, 1991). However, Hall & Fallowfield's (1989) review found that breast-conserving treatments did not prevent women with breast cancer from experiencing psychological dysfunction. These treatments are, however, being recommended to reduce body image concerns (Ganz et al, 1992; Glanz &

Lerman, 1992; Foltz, 1987; Hall & Fallowfield, 1989; Kiebert et al, 1991) and improve sexual functioning (Glanz & Lerman, 1992; Kiebert et al, 1991).

Links have been demonstrated between body image and self concept in women treated for breast cancer (Foltz, 1987; Mock, 1993). A study was completed to compare body image, as a component of self concept, in women receiving different treatments for breast cancer (Mock, 1993). A questionnaire was mailed to 450 women receiving four different forms of treatment. A follow-up postcard reminder was sent out two weeks later, and the final response rate was 57%. The instruments included in this study were the Body Image Scale (BIS), the Tennessee Self-Concept Scale (TSCS), and the Body Image Visual Analogue Scale (BIVAS).

The findings showed significant differences in body image according to type of surgical treatment experienced by each woman (Mock, 1993). Conservative surgery was found to produce greater body satisfaction than either mastectomy or immediate reconstruction (Mock, 1993). The BIVAS, in particular, was found to be more sensitive to body image differences. However, lower body image, in general, was found with breast cancer patients compared to norms from healthy individuals (Mock, 1993).

A positive correlation was also found between body image and self concept scores. Self concept scores were actually found to be higher than norms, but defensive positive scores were also higher. These later scores might suggest artificially-inflated positive self concept scores (Mock, 1993). As well, the study suggested that the cancer experience may strengthen social support networks which could also contribute to increased scores. In any case, the demonstrated link between body image and self concept suggests that interventions should be concerned not only with physical recovery, but also with potential disturbances in body image and self concept, particularly over the long

term (Mock et al, 1993; Knobf, 1985). It was suggested that future research also further investigate the possible distortion of self presentation shown by the TSCS scores of all groups in this study (Mock, 1993).

Cancer and cancer treatment has other consequences that may affect women's attitudes and perceptions of their physical self. Weight gain in breast cancer patients receiving adjuvant chemotherapy is common (Winningham et al, 1989). Being overweight can contribute and exacerbate the feelings of loneliness and inadequacy as well as the threat of social rejection that often accompanies a cancer diagnosis (Winningham et al, 1989; Wooley et al, 1979). Nausea and diarrhea also often result from adjuvant chemotherapy treatment for women with breast cancer (Winningham & MacVicar, 1988). Decreased participation in daily physical activities as well as decreases in muscle strength and endurance, decreased appetite, and increased fatigue due to treatment (Winningham et al, 1986) also contribute to a gradual loss of physical and functional capacity (MacVicar et al, 1990; Winningham, 1991; Winningham et al, 1986; Winningham & MacVicar, 1988).

In particular, a review examining functional self concept found that definitive surgery and radiation produced disability in 16-46% of patients (Foltz, 1987) with a duration rate of disability lasting between one to five years. Chemotherapy was associated with higher disability rates (64%) with no studies found to indicate the length of disability duration (Foltz, 1987). It was suggested that multimodal treatment, common in breast cancer treatment, may also add to the duration of disability (Foltz, 1987).

Exercise and Breast Cancer

Exercise has been examined as a possible component of rehabilitation programs to help increase physical functioning, and improve psychological adjustment and coping with breast cancer diagnosis and treatment

(Friedenreich & Courneya, in press; MacVicar & Winningham, 1986; MacVicar et al, 1990; Mock, et al, 1994; Winningham & MacVicar, 1988; Winningham et al, 1989). Moderate aerobic activity during breast cancer treatment may be beneficial for controlling nausea and weight gain resulting from chemotherapy, in promoting physical well-being and functional capacity, and reducing fatigue and mood disturbance (MacVicar et al, 1990; MacVicar & Winningham, 1986; Mock et al, 1994; Molinaro et al, 1986; Winningham et al, 1989; Winningham & MacVicar, 1988). As well, Taylor et al (1984) found that changes in exercise patterns were fairly common, and significantly related to adjustment to breast cancer. Appendix A summarizes the studies that have specifically examined exercise and breast cancer.

Physical and functional capacity. The majority of the exercise rehabilitation research in breast cancer has been conducted by two researchers: Maryl L. Winningham and Mary G. MacVicar from The Ohio State University. Initially, they examined the response of cancer patients on chemotherapy to a supervised exercise program (MacVicar & Winningham, 1986). Their objectives were to determine if women with Stage II breast cancer on chemotherapy could enhance their functional capacity, and to determine the relationships between participants' functional capacity and mood states.

A three group design with repeated measures was used in this study. The groups included six women with breast cancer in the experimental group (exercisers), four breast cancer patients in the control group (non-exercisers), and another exercising control of six deconditioned but healthy women. The exercisers participated in a 10 week moderate aerobic interval training program consisting of alternating higher and lower intensity workloads on bicycle ergometers.

A comparison between pre and post test results found that total mood disturbance scores, as measured by the Profile of Mood States, decreased for both exercising groups, but increased for the control, non-exercising group (MacVicar & Winningham, 1986). As well, there were significant differences in VO_2L between the exercising and non exercising cancer patients ($p < 0.05$). It was also found that exercising cancer patients reported a reduction in nausea (MacVicar & Winningham, 1986).

Several limitations should be noted in this study. The small sample size limits generalizability to other cancer populations. As well, it was not possible to randomize all participants nor were groups similar on functional capacity (VO_2L) at pretest (MacVicar & Winningham, 1986). However, this study does demonstrate that aerobic training may have potential for improving functional capacity and mood states of cancer patients in a similar pattern shown by healthy subjects.

A more recent study also demonstrated the potential effects of aerobic interval training on cancer patients' functional capacity (MacVicar et al, 1990). Forty-five women with Stage II breast cancer completed this study. Subjects were stratified according to the highest metabolic value achieved at pretest, and then randomized to experimental, placebo, and control groups. The experimental group followed an interval training cycle ergometer protocol that included alternating higher and lower exercise intensities three times per week for ten weeks. The placebo group met with staff for stretching and flexibility exercises while the control group was instructed to carry on with their normal activities. Functional capacity was measured by the highest oxygen uptake achieved during exercise pre and post tests. Heart rate, workload, and maximum time to achieve $VO_{2L_{max}}$ were also used to evaluate the exercise response.

The results indicated that the experimental group could work longer and achieved higher intensity workloads at posttest compared to both placebo and control groups (MacVicar et al, 1990). Specifically, there were significant differences between the experimental and placebo groups on $VO_{2L_{max}}$, maximum workload, and test time. These results demonstrate the improved functional and physical capacity of the exercising group. While self care and daily living activities were not assessed in this study, increases in participants' functional capacity could potentially improve their ability to carry out these activities (MacVicar et al, 1990).

MacVicar et al (1990) also suggested that future research should test a larger sample of breast cancer patients at more advanced stages of disease and with other treatment modalities. As well, the exercise protocol was very specific, and therefore, other methods of exercise can not necessarily be assumed to provoke similar results.

Another prominent researcher is Victoria Mock from the Boston College School of Nursing. Mock et al (1994) examined, using the Roy Adaptation Model, a nursing rehabilitation program for women with breast cancer receiving adjuvant chemotherapy. The purpose of the program was to determine the physical and psychosocial adaptive response from participation in a comprehensive rehabilitation program. This program consisted of an exercise component and support group that focused on helping patients develop physical stamina and coping skills, and promote more adaptive responses to breast cancer diagnoses and treatments. The exercise component included a progressive, regular walking program in the participants' own neighbourhoods. The program was designed specifically for people living with cancer.

A convenience sample of women with breast cancer was used in this study. They were drawn from a group being evaluated for postsurgical adjuvant

chemotherapy protocols. Participants were randomized in clusters to an experimental or usual care group. The usual care group received the standard care provided by staff in the hospital outpatient oncology clinics while the experimental group received the comprehensive rehabilitation program and usual care. The psychosocial questionnaires were administered three times: before chemotherapy, midway through, and one month after the last chemotherapy cycle.

Eighteen participants were initially involved in the study, but four withdrew for unrelated reasons. The experimental group ($n = 9$) all exercised for a minimum of 30 minutes, three or more times per week throughout the program (Mock et al, 1994). The experimental group all walked significantly further than the usual care group who reported decreasing their physical activity during chemotherapy (Mock et al, 1994). The difference between groups for psychosocial adjustment was significant at midtreatment with the usual care group experiencing more emotional distress (Mock et al, 1994). Self concept scores were constant in both groups over the three time periods, while body image remained constant for the experimental group and decreased for the usual care group. The midtreatment test scores showed significant differences in fatigue and depression between the two groups with higher scores in the usual care group (Mock et al, 1994). More nausea and vomiting were reported by the usual care group, but the differences were not statistically significant (Mock et al, 1994).

Several of the instruments used in this study had limitations. A ceiling effect was found for the Karnofsky Performance Status Scale (KPS) which measured physical functioning, and the 12-Minute Walking Test was only moderately sensitive to changes in physical functional status (Mock et al, 1994). It was suggested that a more comprehensive measure of functional status

would help discern changes in ability to perform daily activities (Mock et al, 1994). It was also suggested that the self concept scores possibly did not vary because this construct is generally stable or because the Tennessee Self Concept Scale did not adequately reflect changes in this small sample.

Other study limitations include the small, convenience sample size. Moreover, it is difficult to assess the attributional contributions of the exercise and support components to the ensuing results (Mock et al, 1994). Recommendations were made regarding future research into the use of exercise as a therapeutic intervention for patients with cancer. However, the authors concluded that the intervention was promising in helping women with breast cancer adapt to adjuvant chemotherapy treatment (Mock et al, 1994). More research examining the role of exercise clearly need to be completed; however, the current results demonstrate its potential benefits on physical and functional capacity.

Psychological role. The potential benefits of exercise have also been examined to assess its influence on quality of life (Young-McCaughan & Sexton, 1991), self esteem and health habits (Nelson, 1991). A retrospective investigation of the relationship between aerobic exercise and quality of life in women with breast cancer was completed by Young-McCaughan and Sexton (1991). The purpose of the study was to determine if quality of life was higher in women with breast cancer who exercised compared to women with breast cancer who did not exercise. A convenience sample was recruited from surgical and radiotherapy practices associated with two university hospitals.

Participants were mailed a questionnaire that asked about demographic variables, cancer history, activity/exercise, quality of life, and perceived barriers to exercise. The content validity of this questionnaire was pretested by sixteen women. The cancer history of the questionnaire included questions about time

of diagnosis, menopausal status at time of diagnosis, and types of cancer-related treatments being received at the time the questionnaire was completed. The women were also asked to identify activities from a list that they were currently participating in, and how often they were involved in these activities before and after diagnosis. The Quality of Life Index for Patients with Cancer was used to measure general physical conditioning, normal human activities, and personal attitudes related to general quality of life. A modified version of the Perceived Barriers to Exercise Scale was also used. Participants responded to 14 statements using a 5 point Likert-type scale. The total sample size analyzed was 71 women with a return rate of 58.5%.

Results showed that 59% of the women were classified as exercisers (Young-McCaughan & Sexton, 1991). Exercisers were defined as women participating in one of the exercise activities at least two to four times per week. As well, it was found that women who exercised had a significantly higher quality of life than the non exercisers (Young-McCaughan & Sexton, 1991). In addition, the exercisers had always been active and continued their active lifestyles after their breast cancer diagnosis (Young-McCaughan & Sexton, 1991). These women also perceived significantly fewer barriers to exercise than the non exercising group. An open-ended question at the end of the questionnaire reaffirmed the positive role that exercise played in the lives of these women. Generally, the exercising participants did decrease the frequency of their activities but did not switch to less strenuous activities (Young-McCaughan & Sexton, 1991). However, 31% of the women were able to maintain their exercise routines after their diagnoses, and 16.9% were able to increase their exercise levels after diagnoses (Young-McCaughan & Sexton, 1991).

The retrospective, self report style questionnaires posed a limitation to the study. It was suggested that people tend to overestimate how often they exercise. As well, exercise intensity, duration, or rate of progression were not able to be assessed using this questionnaire (Young-McCaughan & Sexton, 1991). It was also suggested that women who exercise were more motivated to respond to the questionnaire (Young-McCaughan & Sexton, 1991). The convenience sample size was not large, and the respondents consisted mostly of upper-class, white women in an early stage of disease. As well, there were no women undergoing radiation therapy, and only three women receiving adjuvant chemotherapy. The findings of these results are, therefore, difficult to generalize across disease stages and treatments, and socioeconomic and ethnic classes.

Another study, based on the Health Belief Model, examined perceived health, self esteem, health habits, and perceived benefits and barriers to exercise in both women who have and have not experienced Stage I breast cancer (Nelson, 1991). The objectives were to compare these variables across both groups of women, and to examine the relationship between these variables across women who have and have not received mastectomies. As well, the study planned to examine the effect of elapsed time since breast cancer treatment on perceived health, self esteem, health habits, and perceived benefits and barriers to exercise.

A total of 108 women were included in the sample with fifty-four women in each of the breast cancer and non-breast cancer groups. The instruments used in this study included the Rosenberg Self Esteem scale, the Health Promoting Life-Style Profile, and the Exercise Benefits/Barriers Scale. The women with breast cancer were mailed a questionnaire package and self-addressed return envelope. A postcard reminder was mailed out two weeks

later. Sampling for the cohort group then began, and a matched subject for every woman with breast cancer was found. Age and family income were the matching variables.

Independent, two tailed t-tests found that the groups were not significantly different on perceived health, self esteem, and health-promoting behaviours, but they were significantly different on perceived benefits and barriers to exercise (Nelson, 1991). Differences in perceptions between groups were found, however, prior to t-test analysis.

Seventy-four percent of the women with breast cancer reported exercising. Walking was the most common form of exercise, followed by stretching exercises, stationary bike, aerobics, and swimming. Eighty-five percent of the matched cohort reported participating in some form of exercise. Ten of 14 women with breast cancer who reported not exercising also reported other chronic illness such as heart problems or arthritis. However, only five of the eight matched women who did not exercise reported suffering from complicating chronic illness. This difference may have contributed to the initial difference in perceptions to exercise found between the two groups. It was suggested that perhaps these women did not know how to exercise while suffering from chronic illness (Nelson, 1991).

It would appear that self esteem did not seem to be negatively influenced by the breast cancer experience. However, women with breast cancer who practiced more health-promoting behaviours, such as physical activity, reported higher self esteem ratings (Nelson, 1991). It was suggested that these exercisers may have an increased sense of personal control and well-being (Nelson, 1991).

This study only included women with Stage I breast cancer within five years of diagnosis and treatment. It is difficult to generalize beyond this group

to other disease stages and elapsed time periods since diagnosis and treatment. It is possible that progressive disease state and related treatment may have a different impact on responses (Nelson, 1991). Moreover, 45% of women with breast cancer declined to participate in this study. Their reasons were not known, however, their participation may have influenced the study's results differently (Nelson, 1991). Social desirability and self presentation bias may have also influenced the reported responses. The respondents' may have desired to appear well-adjusted, especially for themselves. More research that examines exercise's potential psychological role is clearly needed to assess further its use as part of recovery and rehabilitation from breast cancer diagnosis and treatment.

Exercise and Self Esteem Model

The Exercise and Self Esteem Model (EXSEM) was first introduced by Sonstroem and Morgan (1989), and variations of this model have been examined several times using different populations (Sonstroem et al, 1991; Sonstroem et al, 1993; Sonstroem et al, 1994). Appendix B summarizes the studies that examined EXSEM. The model is based on self structure research that emphasizes multiple self components rather than global constructs. Each specific component is based on perceived competencies in particular spheres, and has previously been shown to relate to exercise (Sonstroem & Morgan, 1989). In addition, the model is organized hierarchically with lower levels influenced by behaviour and environment while higher levels are more stable and related to global self esteem.

The original EXSEM included the variables of physical self-efficacy, physical competence, and physical acceptance as mediators between objective physical measures and global self esteem (see Figure 1) (Sonstroem & Morgan, 1989). Data collected from physical tests or work expenditures were

used as the physical measures, and provided an objective reality from which competency feelings are developed and generalized (Sonstroem & Morgan, 1989). Physical self efficacy is measured relative to each physical measure, and represents the lowest generality level of the competence dimension (Sonstroem & Morgan, 1989). It is most readily influenced by interactions with the environment (Sonstroem & Morgan, 1989).

The physical competence dimension refers to broader, less well-defined perceptions of the body's abilities which have been generalized from specific task or activity self efficacy (Sonstroem & Morgan, 1989). Physical acceptance is defined as the "degree of feeling of satisfaction or dissatisfaction with various parts or processes of the body" (Secord & Jourard, 1953, p. 343 cited in Sonstroem & Morgan, 1989). Finally, self esteem is a global construct defined as the degree to which individuals feel positive about themselves, and is more stable than the previously-defined constructs (Sonstroem & Morgan, 1989).

The model hypothesized that physical measures of specific tasks would directly influence the related task self efficacy. This specific self-efficacy, in turn, affected more general physical competence which then influenced both physical acceptance and global self esteem. Physical acceptance also contributed to self esteem. Physical acceptance was included in the model because it has long been considered an important aspect of self regard (Sonstroem & Morgan, 1989; Wylie, 1974). However, while physical acceptance and physical competence were placed on the same level of generality, it was felt that exercise would directly affect self efficacy and competence. They would then mediate the effects of physical acceptance on self esteem. Furthermore, comparisons of the physical competence and physical acceptance dimensions on self esteem could also be done when they are included on the same level of generality (Sonstroem & Morgan, 1989).

The structural relationships along the competence dimension of EXSEM were tested with middle-aged women and men from a cardiac rehabilitation program ($n = 33$), a community fitness program ($n = 37$), and from telephone and personal contact ($n = 75$) (Sonstroem et al, 1991). Expectations of personal efficacy at walking, stair-climbing, and jogging, and overall physical competence and self esteem were assessed using five different structural models. Results supported the original proposed EXSEM pathways. Generally, global self esteem was found to be influenced by a generalization of competence that originated with physical self efficacies specific to a particular exercise activity.

A longitudinal path analysis of EXSEM's competence dimension was also examined with 93 male interscholastic varsity swimmers (Sonstroem et al, 1993). The proposed model was modified by substituting the evaluations of swim mechanics for self efficacies at the most specific level of self perception, and data collection was conducted three times across five months. Swim performance was expected to be related to evaluations of swim mechanics which, in turn, was expected to be associated with perceived physical competence. The latter was then expected to be related to self esteem. These hypotheses were anticipated both within and across time. Results showed that the hypothesized relationships among swim performance, skill efficacy, perceived physical competence, and self esteem across time were significant and supported (Sonstroem et al, 1993).

Finally, a study examining the validity of expanding EXSEM, to include two levels of perceived competence, was conducted (Sonstroem et al, 1994). The expanded competence dimension was based on the Physical Self-Perception Profile, and included a general physical self worth, and specific subdomains of perceived sport competence, physical condition, attractive body,

and strength. Participants consisted of 216 female adult aerobic dancers contacted at aerobic dance classes. It was generally found that exercise in female aerobic dancers was associated with positive evaluations of their physical condition, but negative evaluations of their bodies (Sonstroem et al, 1994).

Physical acceptance, as part of EXSEM, has not yet been tested. The model expansion research that included Attractive Body as a first level subdomain of perceived physical competence, as just discussed (Sonstroem et al, 1994), found it to be highly correlated with physical self worth ($r = 0.85$), the second level of perceived physical competence. There was concern regarding overlap between these two variables. It was suggested that both body and physical self worth scales be included as an acceptance dimension rather than a competence dimension. This recommendation would necessitate a re-examination of the original EXSEM as proposed by this research.

The EXSEM theoretical framework follows Curbow and Somerfield's (1991) recommendation that a combination of standard global measures and specific measures of self affected by particular cancers or treatments should be used in self esteem research. The emphasis on physical acceptance and physical competence within EXSEM reflects the reported literature on the influence of breast cancer on both these aspects. It is hoped that measures based on this model will be sensitive enough to detect subtle differences in self esteem between individuals.

Chapter 3

Methods

Participants

Participants were female volunteers from four breast cancer support groups. Three of the groups were based Calgary, Alberta, and the fourth group was based in Edmonton, Alberta. Two of the groups were from the same program but based in the two different cities. These group members have been treated for breast cancer, and are participating in the support groups as part of rehabilitation from diagnosis and treatment.

An estimate total of about 170 women belonged to these breast cancer support groups. However, fewer women attended the groups on the evenings the questionnaires were distributed, and 109 questionnaires were handed out. Sixty-four questionnaires were returned for a 58.7% participation rate. Questionnaires were not initially identified by support group so the proportion of respondents from three of the groups is not known. Direct telephone contact with each member of the fourth group ensured a 100% return rate from them.

This exploratory study attempted to gain as much information as possible about this population, and to this end, included all stages of breast cancer, types of treatment, all ages over 18 years old, incomes, education, etc. to ensure a cross-sectional sample group. The participants' characteristics and cancer history are displayed in Tables 1 and 2.

Procedure

The breast cancer support group coordinators were initially approached regarding their potential interest and participation in the study. They all indicated their tentative interest and participation based on ethics approval. An ethics proposal was then submitted to the university's ethics committee, and approval for the study was received.

Recruiting methods were different for several of the support groups, and each method will be described separately. However, the methods were standardized as much as possible to provide consistency in recruiting the participants. The same information was relayed to each group or individual regarding the research project.

The coordinators for two of the support groups invited the researcher to attend their monthly support group meeting, and present the study to the attending women. They were not willing to provide names and phone numbers, but felt that the women could choose to participate themselves based on the presentation at the support group meeting. The research project and its purpose were explained to the entire support group during the business section of their meetings. It was stressed that participation was voluntary, and anonymity and confidentiality would be ensured. The questionnaire package, including the cover letter, two consent forms, and a self-addressed 9" x 12" envelope, were distributed to interested participants. The participants were invited to fill out the questionnaire package which required about 20-30 minutes of their time. One copy of the consent form was to be included with the returned questionnaires, and participants retained their own copy. Any questions were answered during the support group meeting, and the women were encouraged to phone the researcher if there were any questions upon reading through the questionnaire package. Several women did call, and their questions were satisfactorily answered. Fifty-five questionnaires were distributed to both groups with 35 questionnaires going to the larger group.

A follow-up visit the next month was done with the larger group, and 19 more questionnaires were distributed. A third reminder was included in the agenda for this group for the following meeting. The group coordinator for the

smaller group included a reminder regarding the study in her agenda for the month following the initial visit.

The structure for the third support group was different from the first two groups because it included weekly meetings of smaller groups based on individual interests. The group coordinator provided 16 names and phone numbers of women that she felt would be approachable and willing to participate in the study. All the women were phoned, and the same information was conveyed to them as to the entire support groups. All the women indicated their interest in participating in the study although two of the women had already received the questionnaire package from their support group meetings. All of these women returned their questionnaire.

The fourth support group was located in a different urban centre than the previous groups. The group coordinator was contacted, and the study was explained to her. She thought that the group would be interested in participating in the study, and suggested that the researcher mail questionnaire packages to her. Another cover letter, which contained the same information discussed with the previous potential participants, was included with the packages to be read to the group by the coordinator. Twenty questionnaire packages were provided, and a follow-up phone call reminder to the group coordinator was also done.

Measures

The questionnaire package focused on the different concepts outlined in the Exercise and Self Esteem Model (EXSEM) which were exercise participation, physical competence, physical acceptance, and global self-esteem. The questionnaire package is described in the following paragraphs.

Background Information. This questionnaire included demographic and medical variables (see Appendix C). The demographic variables consisted of

closed-ended questions about age, marital status, education, ethnic origin, and family income. The medical variables consisted of both closed and open-ended questions regarding stage of disease, time since breast cancer diagnosis and treatment, type of surgical procedure, type of chemotherapy, type of radiation treatment, and menopausal state during treatment.

Rosenberg Self-Esteem Scale (RSE). This questionnaire measured global self-esteem, and was developed to assess general feelings of self-acceptance and self-respect (see Appendix D). It has been a widely used measure of self esteem in psychosocial oncology literature (Curbow & Somerfield, 1991). The RSE was originally a unidimensional 10-item Guttman scale. The ten items were rated on a four point scale, and when scored as a Guttman scale, produced scores from zero to six (Curbow & Somerfield, 1991). Internal consistency was established with a reproducibility coefficient of 0.92 and a scalability coefficient of 0.72 (Rosenberg, 1965). Convergent validity has also been established at 0.56, 0.67, and 0.83 with three other measures of self esteem (Wylie, 1974).

Curbow & Somerfield (1991) reviewed the use of the RSE in studies with cancer patients. They found that cancer researchers used Likert-type scales, and reversed either the positive or negative items to create one summary score (Curbow & Somerfield, 1991). Several scoring methods, other than Guttman scoring, have been used to achieve this summary score. A four point scale with a possible range of 0 to 30 (Gottesman & Lewis, 1982) or 10-40 (Lewis, 1982 cited in Curbow & Somerfield, 1991, Nelson, 1991) has been used. As well, seven point scales and other modified versions of the RSE are mentioned in Curbow & Somerfield's review (1991).

Regardless of the method, high internal reliabilities have been found for the RSE. Curbow & Somerfield's (1991) review of studies using the RSE found

Cronbach's alpha coefficients ranging from .76 to .87, and test-retest reliability of .74 over seven months. Wylie (1989) also reviewed the RSE, and reported internal consistency reliabilities ranging from .87 to .72 and test-retest reliabilities of .85 (two weeks) and .63 (seven months). Internal consistency was calculated for the present study, and was found to be .97. In addition, a four point scale was used with scores ranging from 10 to 40, and items were reverse scored so that higher scores meant higher self esteem.

Body Image Visual Analogue Scale (BIVAS). This instrument measured the physical acceptance variable in EXSEM (see Appendix E). The BIVAS is a straight 100 millimetre vertical line used to measure body satisfaction with end point descriptors of "complete dissatisfaction" at the bottom of the line and "complete satisfaction" at the top. The subject marks the line at the point indicating the degree of satisfaction. The distance in millimetres from the bottom end of the line to the marked point becomes the subject's score. The VAS is simple to use and is, therefore, appropriate for a variety of subjects. However, some people find it difficult to convert a subjective sensation or perception to a straight line (Gift, 1989; Wewers & Lowe, 1990). This disadvantage can be overcome by teaching subjects how to use the scale or by providing detailed written instructions at the top of the scale (Gift, 1989; Wewers & Lowe, 1990).

The majority of studies evaluating the psychometric properties of the VAS are from the literature on pain and mood states (Wewers & Lowe, 1990). Generally, visual analogue scales are considered to be reliable and sensitive (Gift, 1989; Wewers & Lowe, 1990). Concurrent, construct, and discriminant validity have all been successfully demonstrated using the VAS to measure various dynamic phenomena including pain, depression, and body image (Gift, 1989; Mock, 1993; Wewers & Lowe, 1990). The VAS has also been reported to

be more sensitive than other measures of subjective sensations (Gift, 1989). It is particularly recommended when sensitivity is desirable. A study examining body image in women treated for breast cancer found differences in body image using the BIVAS that were not detected by the Body Image Scale and the Physical-Self subscale of Tennessee Self-Concept Scale (Mock, 1993). As well, both test-retest and Interrater reliability has also been demonstrated for the VAS (Gift, 1989; Wewers & Lowe, 1990).

Physical Self-Efficacy Scale (PSES). This 22-item questionnaire measured the physical competence dimension of the EXSEM (see Appendix F). Ten items addressed perceived physical ability (PPA) and twelve items measured physical self-presentation confidence (PSPC). Development of the scale was prompted by a lack of measures that directly assessed physical competence (Ryckman et al, 1982).

Five studies were done to develop the PSES and test its psychometric properties. Initially, a pool of 90 6-point Likert items was created. These items dealt with generalized expectancies regarding perceived competence in performing tasks that required physical skills (Ryckman et al, 1982). As well, this pool included items related to level of confidence in displaying these skills, and having the skills evaluated by other people (Ryckman et al, 1982). A principal factor analysis led to three factors including Perceived Physical Ability, Physical Self-Presentation Confidence, and Physical Appearance. However, only a few items adequately loaded on Physical Appearance and were influenced by social desirability. Physical Appearance was then eliminated. The end result was the current 10 item PPA with a range from 10 to 60, and 12 item PSPC scale with a range from 12 to 72. The two subscales are largely independent yet also related ($r = +.26$, $p < .05$), and can be summed to produce an overall PSES score (Ryckman et al, 1982). These scores can range from 22

to 132 with higher scores reflecting a stronger sense of physical self efficacy. Items are reverse scored to facilitate this interpretation of scores.

Internal consistencies for both subscales and composite PSES were very satisfactory. Coefficient alphas were .84 for PPA, .74 for PSPC, and .81 for PSES in Study one, and .85 for PPA, .75 for PSPC, and .82 for PSES in Study two (Ryckman et al, 1982). This current study found coefficient alphas at .82 for PSES, .83 for PPA, and .69 for PSPC. Ryckman et al's second study also examined test-retest reliabilities, and found highly satisfactory results; .85 ($p < .001$) for PPA, .69 ($p < .001$) for PSPC, and .80 ($p < .001$) for PSES (Ryckman, et al, 1982). Study three found good convergent validity for the PSES, particularly with the Tennessee Physical Self Concept (TPSC) (Ryckman et al, 1982). Correlations with the TPSC were .43 ($p < .001$) for PPA and .52 ($p < .001$) for PSPC. Concurrent and discriminant validity were also demonstrated for both subscales and the PSES (Ryckman et al, 1982). Study four and five examined predictive validity, and found that the PPA subscale was a more powerful predictor than the PSPC for sports participation and performance.

Godin Leisure Time Exercise Questionnaire (GLTEQ). This self-report instrument measured exercise participation (see Appendix G). Three questions asked about the frequency of mild, moderate, and strenuous exercise in a typical week (7 days) (Godin et al, 1986; Godin & Shephard, 1985). Only leisure time exercise sessions lasting 20 minutes or longer in duration were included. A total exercise index was calculated by weighting the frequency of each exercise intensity. The weighting formula is $(3 \times \text{mild}) + (5 \times \text{moderate}) + (9 \times \text{strenuous}) = \text{total exercise score}$ (Godin et al, 1986; Godin & Shephard, 1985).

This instrument has been found to be reliable and valid (Godin & Shephard, 1985; Godin et al, 1986). Two week test-retest reliability coefficients

have been reported at .94, .46, and .48 respectively for self reports of strenuous, moderate, and light exercise (Godin & Shephard, 1985), and .64 for total exercise (Godin et al, 1986). Concurrent validity was found with maximum oxygen uptake, body fat, and muscular endurance (Godin et al, 1986). An independent evaluation of ten commonly used physical activity questionnaires also found that the GLTEQ was easily administered, brief, reliable, and valid (Jacobs et al, 1993).

Analysis

Internal consistencies were initially calculated for the Rosenberg Self Esteem Scale and the Physical Self Efficacy Scale. Descriptive statistics, based on demographic and medical variables, were also calculated to provide more information regarding the participants in the study. As well, multiple analyses of variance were completed to examine any differences across these variables. Pearson product moment correlations were then determined to assess the relationships among exercise participation, physical competence, physical acceptance, and global self esteem as per the first hypothesis. Hotelling-Williams Tests were also calculated to compare the correlations between variables and test the second hypothesis. Finally, path analysis was used to assess the mediating effects of physical competence and physical acceptance on the relationship between exercise participation and self esteem as per the third hypothesis. The results of the study will be available to the support groups and participants once it is completed, and any questions about the research will be answered by the researcher.

Chapter 4

Results

Participants' Characteristics

The majority of women in this sample were married and well-educated. Two thirds of these women had either completed some or all of their university or college education. As well, the women ranged in age from early thirties to over 70 years old with the average age being about 51 years, and about half of the women reported an annual family income between \$20 000 to \$39 000 and \$40 000 to \$59 000. Approximately half of the women also indicated that they had a British ethnic background while about another fifth reported mixed ethnicity. Table 1 summarizes the participants' characteristics.

Insert Table 1 about here

Participants' Breast Cancer History

All stages of breast cancer history were represented, but two thirds of the women reported being in either Stage I or Stage II. Almost half of the women were diagnosed in the last two years. Furthermore, one third of women were still undergoing treatment while slightly less than one third had completed treatment within the last 12 months. All the women, except one, reported having had surgery, and the majority also reported having received chemotherapy and radiation therapy. As well, about half of the women who responded to the menopause question indicated that they were pre-menopausal during treatment. A small number of women added that they were perimenopausal during treatment even though this question was not specifically asked in the questionnaire. Table 2 summarizes the breast cancer history of the participants.

Insert Table 2 about here

Exercise and Self Esteem Model

Summary statistics. Descriptive statistics were also calculated for : exercise participation, physical competence, physical acceptance, and global self esteem. Summary statistics can be found in Table 3 which also specifies the outcome of each measure used to assess EXSEM concepts. Average total self esteem was 33.91 out of a possible maximum score of 40 while average body image reported was 72.59 mm based on a 100 mm line (SD = 21.56). Reasonable overall physical self efficacy was also generally reported ($X = 88.91$) with an average PSPC of 51.27 and average PPA of 37.64. As well, women generally participated in more moderate and mild exercise than strenuous exercise during a typical week. Wide variability was reported for these variables as indicated by their standard deviations (see Table 3).

Insert Table 3 about here

Demographic and medical differences. The demographic and medical variables were analyzed, using multiple analyses of variance, with respect to the EXSEM concepts of exercise participation, physical competence, physical acceptance, and global self esteem. Differences within the group were found with income, stage of disease, and menopausal state during treatment.

Followup univariate F tests indicated that strenuous exercise ($F(5,54) = 3.72, p < 0.007$) and total esteem ($F(5,54) = 2.96, p < 0.02$) differed for level of income (Wilks' lambda = 0.39, Approx. $F(35, 204) = 1.47, p < 0.054$). Tukey's post-hoc analyses ($p < 0.05$) were calculated to examine further these

differences. It was found that women with an annual family income of \$60 000 to \$79 000 exercised strenuously significantly more often than women with an annual family income of less than \$20 000, \$20 000 to \$39 000, and more than \$100 000. As well, Tukey's post-hoc analyses ($p < 0.05$) showed that total self esteem was higher for women with an annual family income of $> \$20\,000$ as compared to $< \$20\,000$.

Followup univariate F tests also indicated that total self esteem ($F(4, 57) = 4.00, p < 0.007$) and physical self presentation confidence (PSPC) ($F(4, 57) = 2.93, p < 0.029$) differed for stage of disease (Wilks' lambda = 0.48, Approx. $F(28, 185) = 1.49, p < 0.066$). Further examination of these differences using Tukey's post-hoc analyses ($p < 0.05$) revealed that women with Stage I, II, and IV breast cancer had significantly higher self esteem than women who did not know their stage of disease. As well, women with Stage IV breast cancer had higher PSPC than women who reported that they did not know their stage of disease.

Followup univariate F tests also indicated that mild exercise ($F(2, 51) = 5.24, p < 0.01$), total self esteem ($F(2, 51) = 5.08, p < 0.011$), and PSPC ($F(2, 51) = 5.00, p < 0.011$) differed for menopausal state during treatment. Tukey's post-hoc analyses ($p < 0.05$) demonstrated that women who were menopausal during treatment ($N = 3$) participated in milder exercise more often than women who were either pre or post menopausal during treatment. Total self esteem and PSPC was also found to be higher for women who were post menopausal during treatment compared to pre menopausal participants.

Correlations were also calculated with all continuous demographic and medical variables. Age was found to be significantly correlated with total self esteem ($r = 0.27, p < 0.017$) and body image ($r = 0.29, p < 0.011$) such that older

women had better self esteem and body image. No significant correlations were found with time since diagnosis or time since treatment.

Study hypothesis #1. The first hypothesis stated that exercise participation, physical competence, physical acceptance, and global self esteem would be positively correlated. This hypothesis was tested using Pearson product moment correlations to assess these relationships. The correlation matrix of mild, moderate, strenuous, and total exercise, perceived physical ability (PPA), physical self presentation confidence (PSPC), and physical self efficacy (PSES), body image, and total self esteem is presented in Table 4.

Insert Table 4 about here

As demonstrated in Table 4, significant correlations were found among the measures assessing the EXSEM concepts. In particular, strenuous exercise participation was found to be positively correlated with both PPA and PSES as well as total self esteem. PPA was also positively correlated with body image and total self esteem. Higher PSPC and PSES were also both related to higher body image and total self esteem. As well, women with higher body image also had higher total self esteem. However, body image was not significantly correlated with any type of exercise participation. The first hypothesis is, therefore, partially supported with the exception of the lack of relationship between physical acceptance and exercise participation.

Study hypothesis #2. The second study hypothesis stated that exercise participation would be more highly correlated with physical competence than physical acceptance or global self esteem. A preliminary analysis of the correlation matrix indicated that strenuous exercise and PPA were the most

appropriate subscales to represent the exercise participation and physical competence concepts respectively. Hotelling-Williams Test was calculated to determine the strength of the relationship between strenuous exercise and perceived physical abilities as compared to body image or total self esteem. The calculations showed that the relationship between strenuous exercise and perceived physical abilities was not significantly stronger than the relationship between strenuous exercise and total self esteem. However, this comparison did approach significance ($z = 1.50$, $p = 0.07$ one tailed). The relationship between strenuous exercise and perceived physical abilities was significantly stronger, however, than the correlation between strenuous exercise and body image ($z = 1.75$, $p = 0.04$ one tailed). The second hypothesis is, therefore, partially supported.

Study hypothesis #3. The third hypothesis stated that physical competence and physical acceptance would mediate the effect of exercise participation on global self esteem. Path analysis ($p < 0.05$) was calculated to assess this mediating effect. Figure 2 shows the results of this path analysis.

Insert Figure 2 about here

Strenuous exercise and PPA again represented the exercise participation and physical competence concepts respectively in the path analysis. Total self esteem was then regressed on body image, PPA, and strenuous exercise. These variables were found to explain 46% of the variability in total self esteem. Significant regression coefficients were found for body image and PPA but not strenuous exercise.

Body image was also regressed on PPA and strenuous exercise. Ten percent of the variability in body image was explained by PPA and strenuous

exercise. A significant regression coefficient was found for PPA, but not for strenuous exercise. As reported earlier, higher perceived physical ability was related to more strenuous exercise participation. As well, 14% of the variability in PPA was attributed to strenuous exercise.

The path analysis, therefore, does demonstrate that both physical competence and physical acceptance mediate the effect of exercise participation on global self esteem. However, because there is no relationship between physical acceptance and exercise participation, physical competence does not mediate between these two variables, as hypothesized by EXSEM.

Chapter 5

Discussion

The Exercise and Self Esteem Model was used as a theoretical framework to examine the relationships among exercise participation, body image, physical self efficacy, and self-esteem in women who have been treated for breast cancer. Results from this exploratory study indicate the potential for women with breast cancer to benefit psychologically from exercise participation during and following breast cancer treatment.

Psychometrics

The measures used to assess the Exercise and Self Esteem concepts were generally found to be psychometrically robust with good reliability and validity. Internal consistency values were calculated for the Rosenberg Self Esteem Scale as well as the Physical Self Efficacy Scale, and its two subscales: Perceived Physical Ability and Physical Self-Presentation Confidence. The coefficient alpha for the RSE was .87 which compared favorably to previous findings ranging from .72 to .87 (Curbow & Somerfield, 1991; Wylie, 1989). Internal consistency values found for PSES (.82), PPA (.83), and PSPC (.69) in this study were also similar to those values reported by Ryckman et al (1982) in the development of the instrument. Previously reported values were .81 and .82 for PSES, .84 and .85 for PPA, and .74 and .75 for PSPC (Ryckman et al, 1982). Therefore, these measures are reliable in a breast cancer population.

Participant Distribution

Participants tended to be married, well educated, and have a reasonable to good annual family income. As well, they tended to have a predominantly British ethnic background although numerous women reported mixed ethnicity. The age range was quite widespread, but the average age was about 51 years old. These characteristics are fairly consistent with other studies examining

exercise and breast cancer (MacVicar et al, 1990; Mock et al, 1994; Nelson, 1991; Young-McCaughan & Sexton, 1991; Winningham & MacVicar, 1988) although the women in this study generally tended to have more university or college education. This characteristic may be reflective of the support group sampling which may represent a greater proportion of well-educated women.

In order to achieve a strong cross sectional sample, no participant was excluded because of disease stage, type of treatment modality, or phase in treatment. The majority of women reported being in Stage I or Stage II although all stages of breast cancer were represented. In addition, most women had been diagnosed in the last two years with many of them either still undergoing treatment or recently completed treatment within the last year. Surgery was the predominant treatment modality, but most women also reported receiving chemotherapy and radiation therapy.

The participants' breast cancer history is consistent with other research examining exercise and breast cancer (Mock et al, 1994; Nelson, 1991; Young-McCaughan & Sexton, 1991). Young-McCaughan & Sexton (1991) also had no sampling restrictions for breast cancer history, and their participants tended to be similar across stages of disease and months since diagnosis. The same number of women in this study were currently undergoing treatment while slightly more of them had lived longer with breast cancer than Young-McCaughan & Sexton's (1991) participants. Again, this characteristic may be reflective of the support group sampling because there may have been a greater need for support group services among women currently undergoing treatment. As well, those women who had lived with breast cancer for a long time may have been active in the organization and administration of the support groups.

The participation rate for this study (58.7%) was consistent with other retrospective studies examining exercise and breast cancer. Young-McCaughan & Sexton's (1991) study examining exercise and quality of life had 58.5% of their questionnaires returned. As well, 48% of women with breast cancer consented to participate and returned their questionnaires in a study examining perceived health, self-esteem, health habits, and perceived benefits and barriers to exercise (Nelson, 1991). The proportion of respondents for three of the support groups in the present study is unknown because the questionnaires were not initially identified by support group. However, all the women from the fourth group who received telephone calls regarding their potential participation returned their questionnaires. A higher participation rate may have been possible in this study if names, telephone numbers, and addresses were provided for follow up reminder telephone calls or mailings to each individual.

Demographic and Medical Differences

Differences were found for income, stage of disease, and menopausal state during treatment when analyzed across EXSEM concepts. Generally, the trend indicated that women from a higher income bracket tended to exercise strenuously more frequently than women with a lower annual family income or a very high income. This trend is similar to regular physical activity patterns of Canadians reported by the Canadian Fitness and Lifestyle Institute (1996). Higher income brackets tended to be more active, at least every other day, compared to lower income brackets, and specifically, \$60 000 to \$79 000 was one of the most regular group of exercisers (Canadian Fitness and Lifestyle Institute, 1996).

Total self esteem also tended to increase as annual family income levels increased. It is possible that additional financial stresses, as well as the burden

of breast cancer, takes its toll on self esteem. This finding does contrast with Nelson's (1991) study which found no significant correlations between self esteem and income levels for either women who had experienced mastectomies or a matched cohort of community women. However, the fact that both total self esteem and strenuous exercise, which are positively correlated in this study, are influenced by income levels suggests that the role of income should be further investigated. It may play a part in the efficacy of exercise-related interventions for assisting with breast cancer diagnosis and treatment.

Total self esteem was also found to generally be higher for women who reported their stage of breast cancer than for women who indicated that they did not know their disease stage. This finding would be intuitively feasible because uncertainty regarding disease state and progress could potentially impact the degree to which women feel positive about themselves. Similarly, Penman et al (1987) found that viewing life outcomes as being less under one's personal control was related to lowered self esteem in women with breast cancer. Not knowing one's stage of breast cancer could weaken one's sense of personal control, and consequently, lower self esteem.

As well, women with Stage IV breast cancer reported more confidence in displaying physical skills than women who indicated that they did not know their disease stage. It may be that certainty regarding disease state, regardless of stage, enables women to be more aware of their physical limitations and adjust their physical activities accordingly. However, there were only four women with Stage IV breast cancer and nine women who did not know their disease stage so it is difficult to extrapolate from these findings. As well, self reporting of medical data may not necessarily provide accurate information on stage of disease.

Higher total self esteem was found for older women and women who had gone through menopause prior to receiving breast cancer treatment. These self esteem findings are consistent with Penman et al's (1987) study which found that women with breast cancer in their 40s, 50s, and 60s had significantly higher self esteem than women in their 30s. These age differences in total self esteem could also relate to the differences found in menopausal state. Older women are usually menopausal before younger women, and therefore, it is probable that the age factor is influencing higher self esteem.

Physical self presentation confidence was also found to be higher for women who received breast cancer treatment after menopause rather than before menopause. As well, results from this study found that PSPC was related to higher total self esteem. In developing the PSES, Ryckman et al (1982) also found strong correlations between self esteem and PSPC. Given the previously reported relationships between age and self esteem, and age and menopause, it is possible that age may also be a factor in the relationship between PSPC and menopause.

Higher body image was also reported for older women with breast cancer compared to younger women. Feminine self image concerns have also been found across age groups for a cross-sectional sample with concerns decreasing with older ages (Penman et al, 1987). However, it is also recognized that satisfaction with body image is also related to the importance that an individual attaches to physical attractiveness regardless of age (Chrisler & Ghiz, 1993; Vann Rackley et al, 1988). In this sample, body image may be more important for younger women given societal standards of youthful female physical appearance (Schain, 1976; Seid, 1989; Wolf, 1991). Therefore, breast cancer diagnosis and treatment may have had a more profound impact on these women than older women.

A final difference among women participating in this study was the link between type of exercise participation and menopause. Findings showed that women who were in menopause during breast cancer treatment participated more frequently in milder exercise. The possible implication is that menopause, in conjunction with treatment, limited the type of exercise that women were able to participate in. However, it is also difficult to speculate much on this group difference because very few women added that they were perimenopausal during treatment.

Exercise & Self Esteem Model

Relationships among variables. The current research findings showed that women who exercised more often at a strenuous level had higher self esteem compared to women who frequently exercised at more moderate and mild levels. The level of exercise was defined by the amount of effort required to do the activities for 20 minutes or longer in duration. Strenuous exercise included activities like running, jogging, vigorous swimming and bicycling, and squash that resulted in sweating and rapid heart rate.

A review of the exercise and self esteem literature generally found that exercise programs were associated with significant increases in participants' self esteem scores (Sonstroem, 1984). These increases were particularly pronounced in subjects initially lower in self esteem (McAuley, 1994; Sonstroem, 1984). Nelson (1991) also found that women with breast cancer who practiced more health-promoting behaviours, such as exercise, had higher rates of self esteem. It would be interesting to examine further initial self esteem levels in women treated for breast cancer to assess better the potential impact of exercise participation.

The evidence supporting the positive relationship between strenuous physical activity and higher self esteem becomes strengthened when

examining the small frequency and limited variability of strenuous exercise participation. Most women in this study who exercised tended to be more moderately or mildly active. This activity level may be reflective of the fact that many women were either still undergoing treatment or had recently completed it in the past 12 months. It is speculated that being able to continue participating in strenuous exercise while in treatment or to be able to increase it following treatment could contribute to higher esteem levels.

Young-McCaughan & Sexton's (1991) findings also reinforce the potential importance of exercise activity levels. They found that while women generally decreased the frequency of their activities, they did not switch to less strenuous activities. Some women who engaged in multiple exercises prior to diagnosis of cancer gave up one but continued other exercises (Young-McCaughan & Sexton, 1991). As well, 31% of women were able to maintain their exercise routine after their cancer diagnosis while a further 16.9% were able to increase their exercise levels.

Moderate and mild activities may not have had the same relationship with total self esteem for several reasons. It may be that these women have had to change from more strenuous activities before treatment to more moderate and mild exercise during treatment. One woman added in her questionnaire that she was currently under going cancer treatment, and indicated that her normal exercise intensities and frequencies were currently very reduced from previous levels. Another woman commented that she will resume playing doubles tennis twice a week once she receives permission from her oncologist.

Another possibility is that these women are in later stages of breast cancer compared to the women who participate more frequently in strenuous exercise. One woman did comment in her questionnaire that she is no longer able to do a lot of fast walking, cycling, etc. due to bone metastasis. These

speculations could be better examined with a larger sample size that enables further multiple regression analysis based on demographic and medical variables such as stage of disease and time of treatment.

The relationship between physical acceptance and global self esteem is supported by significant correlations and regression analysis, and is also consistent with the literature. A review by Sonstroem (1984) on exercise and self esteem research generally reported strong relationships between body image and self esteem. Furthermore, self perceptions of physical appearance has also been theorized as part of physical self concept and overall general self concept (Fox & Corbin, 1989; Shavelson et al, 1976).

Positive correlations between body image and self concept scores found in Mock's (1993) study are also supportive of the inclusion of body image as an integral component of self concept. It would be informative to further examine the inclusion of physical self esteem in the model as another specific subdomain of global self esteem, and particularly to assess the influence of physical acceptance considering its strong impact on global self esteem.

Physical acceptance, however, was not found to be related to any type of exercise participation. There was no correlation among body image, strenuous, moderate, or mild exercise. This finding contrasts with research examining exercise and body image. Physical activity has been found to improve body image, and consequently, mental health (Eide, 1982). Lafavi's (1991) results also suggested that physical activity led to improved body cathexis and global self concept scores. As well, King et al (1989) found that increased fitness ratings led to improved satisfaction with physical shape and appearance as well as decreased tension and anxiety for female exercisers. Decreased body weight also led to increased self-confidence and alertness for women (King et al, 1989).

One possible reason for the lack of relationship between exercise participation and body image in the present study is that general exercise participation does not address specific body image concerns that are directly related to breast cancer. Body image was earlier defined to include attitudes and perceptions regarding physical appearance, state of health, skills, and sexuality. The finding that only 10% of the variance in body image is attributed to perceived physical abilities and strenuous exercise also supports this possible explanation. It may be necessary to examine specific physical measures, such as range of motion or arm weakness, or return to pre treatment activities to better understand the role that exercise may play in improving body image, and in turn self esteem.

The use of the one item Body Image Visual Analogue Scale in this study may also be a reason for the lack of relationship between body image and exercise participation. A multi-item scale may have provided more body image-related factors, other than degree of body satisfaction, that could have been linked with exercise. A different scale might also be considered if specific physical measures are examined. However, the degree of sensitivity previously reported for the BIVAS (Mock, 1993) may also have been an important contributor to the other current results. This scale could, therefore, be combined with a multi-item scale in future research.

The relationship between physical competence and global self esteem was significant, and regression analysis reinforced the strength of its contribution to global self esteem. Generally, women in this study with a stronger sense of physical self efficacy also had higher self esteem. As well, both perceived competence in performing tasks requiring physical skills and the level of confidence in displaying these skills were significantly related to higher esteem. These findings are consistent with the concurrent validity research

conducted when developing the Physical Self Efficacy Scale (Ryckman et al, 1982). These research results found that PSES as well as its two subscales, PPA and PSPC, were related to higher total self esteem. Perceived physical competence has also been shown to be related to self esteem in other research (Fox & Corbin, 1989; Sonstroem et al 1993)

Another supported EXSEM relationship is between overall physical self efficacy and body image as well as between both subscales, PPA and PSPC, and body image. Generally, women who had a stronger sense of physical self efficacy, better perceived physical abilities, and more confidence in displaying these physical skills also had higher body image scores. To date, physical acceptance, as part of EXSEM, has not yet been examined. Research that examined the expansion of the competence dimension to include a body scale concluded that body scales should be included as an acceptance rather than competence dimension.

Results from this study demonstrated that women who participated in strenuous exercise more often had a stronger sense of overall physical self efficacy, and in particular, had a better perception of their physical ability. As well, higher overall exercise participation, regardless of activity level, related to stronger perceived physical skills. Generally, research has found that exercise participation positively influences perceptions of physical capabilities (McAuley, 1994). Ryckman et al (1982) also found that people with stronger perceived physical skills reported more varied and extensive sports experience as well as more current time involved in sports.

These current study findings are also consistent with research examining the validity and expansion of the competence dimension of EXSEM. Sonstroem et al (1991) found that efficacy expectations across related physical tasks were related, and were generalized to evaluations of physical

competence. Associations were also found between physical competence and perceptions of swim skills that were based in actual performance (Sonstroem et al, 1993). Further breakdown of the physical competence dimension also found relationships among physical activity participation, self-efficacies, and two levels of perceived physical competence (Sonstroem et al, 1993).

The role that exercise participation may play in improving physical competence during or following breast cancer treatment is also enhanced by the research examining the beneficial effects of exercise on functional and physical capacity (MacVicar & Winningham, 1986; MacVicar et al, 1990; Mock et al, 1994). Successful exercise participation, along with improved functional and physical capacity, probably reinforces the level and strength of the belief that physical activity could be performed. As well, the amount of effort and persistence for an activity, and the choice of activities are also strengthened by these self efficacy expectations (Bandura, 1991).

Strength of relationships. Further examination of EXSEM in this study did not find significant differences in the strength of relationships between global self esteem and exercise participation, and physical competence and exercise participation. However, differences between these relationships did approach significance. The modification of EXSEM to exclude physical self efficacy related to a specific activity may have contributed to this finding. The inclusion of exercise efficacy, as a mediator between exercise participation and generalized physical competence, may be necessary to understand further these relationships.

The relationship between physical competence and exercise participation was found to be stronger, however, than the relationship between physical acceptance and exercise participation. This finding was hypothesized

in this study, and is supported by the evidence that the relationship between physical acceptance and exercise participation is not significant.

Mediating effects. Path analysis of the Exercise and Self Esteem Model revealed that the relationship between global self esteem and exercise participation is actually mediated by physical acceptance and physical competence. Sonstroem & Morgan (1989) originally included physical acceptance on the same level of model generality as physical competence in order to permit comparisons of their respective influences on global self esteem. It would appear that physical acceptance has a slightly stronger impact on self esteem than physical competence for women with breast cancer.

The finding that 46% of the variance in global self esteem can be attributed to physical acceptance, physical competence, and exercise participation is a strong result considering the reported number of factors that influence self esteem. Previous EXSEM research examining the competence dimension has found that 29% of the variance in self esteem was explained (Sonstroem et al, 1991). The model, therefore, provides a strong explanation of self esteem as well as of the relationships among variables that may be areas of concern for women treated for breast cancer.

This study also revealed that 14% of the variance in perceived physical abilities was explained by strenuous exercise. This relatively small variability could be affected by the lack of a specific measure of exercise efficacy between physical competence and physical measures as originally included in EXSEM. Sonstroem et al (1991) found that task related efficacies accounted for 46% of the variance in physical competence. Therefore, this intermediate step between generalized physical competence and exercise participation may be an important contributor to their relationship.

Intensity level of exercise participation does not impact on participants' satisfaction with their bodies. This finding is reinforced by the fact that only 10% of the variance of body image was accounted for by perceived physical ability and strenuous exercise. A significant regression was found between body image and perceived physical ability. However, given the lack of relationship between body image and strenuous exercise, PPA is not a mediating factor between these variables as suggested by the model.

Practical Implications

The results of the present study indicate that exercise could potentially play a role in helping women both cope with and rehabilitate from the impact of breast cancer diagnosis and treatment on physical self efficacy and self esteem. In particular, the results indicate that more frequent strenuous exercise is the most effective type of exercise participation for improving self perceptions of physical abilities and enhancing self esteem. These findings are important considering the negative influence of treatment on functional and physical capacity.

The findings also indicate that physical acceptance is an important component of global self esteem for women treated for breast cancer. However, exercise does not appear to be an effective intervention for improving body image given the lack of relationship with exercise participation, and the lack of variability explained by physical competence and exercise participation. Exercise should be included in a rehabilitation program that also has other components that may more effectively enhance physical acceptance, and in turn, self esteem. This recommendation is reiterated by the results from Mock et al's (1994) study that examined a multi-dimensional rehabilitation program. Body satisfaction did not increase for women participating in this program, but it did not decrease as did the usual care group.

Guidelines and recommendations for using exercise as a restorative psychological and physical technique should be considered. Exercise must be continually monitored and re-evaluated with respect to treatment response and potential side effects (Winningham et al, 1986). Modifications specific to the disease and treatment should also be incorporated into the exercise rehabilitation program (Winningham et al, 1986). These considerations should be made for both cancer patients who are accustomed to exercise and those who have been sedentary.

Limitations

Several limitations to this study need to be addressed. The self report nature of the study creates potential methodological limitations because social desirability and self presentation bias may be confounding factors. The women may have wanted to present themselves more favorably to the researcher as well as to themselves. In addition, medical data was obtained through self-report when objective medical data is potentially available through registry databases.

The results are not generalizable because random sampling was not done using a defined population. The convenience sample may also have introduced a self selection bias because more women may possibly have responded who were interested in the nature of the research, and therefore, skewed the response pattern.

The study was also limited by the small cross sectional sample which was composed of predominantly married, well-educated women with higher annual family incomes and British ethnicity. As well, more women were in the early stages of disease. The support group sampling method may have reinforced this sample demographics. The relationship between exercise and self esteem, therefore, could not be fully evaluated for women in other

socioeconomic and cultural groups, and more advanced stages of disease. As well, it is not possible to assess the long term impact of exercise participation on the self esteem, body image, and physical self efficacy of women treated for breast cancer due to the cross sectional sampling.

The original Exercise and Self Esteem Model was modified for this study. It is, therefore, not possible to fully evaluate the model because several components were deleted from the present study. Modifications were required for a breast cancer population in order to accommodate the retrospective nature of the study and the convenience sampling method.

The use of the single item Body Image Visual Analogue Scale may also have impacted the relationship between body image and exercise participation. A multi-item scale may have provided more body image-related factors, other than degree of body satisfaction, that could have been linked with exercise. As well, the state of menopause during treatment question did not include a perimenopausal state although some women added it to their questionnaires. This omission may have skewed the response to the menopausal question so that it did not accurately reflect state of menopause for these participants.

Future Research

The self report limitation of exercise participation may be addressed by the use of objective physical measures as initially proposed by Sonstroem & Morgan (1989). Range of motion, arm strength, and fitness, for example, could be measured to help minimize the tendency to present oneself more favourably or over-report.

A defined population-based study that ensures every woman has an equal chance of being in the study would avoid convenience sampling, and potentially reduce the self selection bias. Access to this population through a registry database, for example, could help to provide a larger potential study

sample as well as objective medical data. A larger sample size would also enable further regression on demographic and medical variables, such as income, age, stage of disease, treatment modality, and time since treatment, that may potentially influence the relationship between self esteem and exercise participation. Stratification across demographic and medical variables, in order to ensure a solid cross sectional sample of women with breast cancer, would also be possible with a population-based study. Research results would then be generalizable to the defined population.

This exploratory, retrospective study demonstrates the potential psychological benefits of exercise for women treated for breast cancer. However, prospective studies with repeated measures that follow women through treatment and recovery would provide additional information on exercise effects. Assessing exercise and self esteem levels prior to treatment could also provide a better understanding of the role that exercise may play in enhancing self esteem among women with different self esteem needs and activity habits. It would also be important to understand perceived barriers to exercise participation that may influence motivation and adherence to an exercise program. In addition, additional exercise intervention research is clearly needed to establish causal relationships among psychological variables such as self esteem and physical competence.

The Exercise and Self Esteem model could also be further expanded to measure more specific components of global self esteem that may be particularly influenced by breast cancer diagnosis and treatment. Physical self esteem, for example, could be included in the hierarchical model as another specific step before global self esteem. The inclusion of physical self esteem may also provide a clearer assessment of the role that exercise may play in enhancing global self esteem.

Future research should also examine a complete Exercise and Self Esteem Model. An exercise efficacy measure could be included that would be directly influenced by exercise participation. This suggestion follows Sonstroem & Morgan's (1989) original EXSEM model, but with a minor adaptation to enable the application of the model to general exercise participation as opposed to specific physical measures. However, future research could also examine specific physical measures, as mentioned earlier, that are directly applicable to breast cancer physical rehabilitation. These specific measures might include functional and physical activities that may potentially be impacted by breast cancer treatment. As well, the use of a multi-item body image scale that relates to the specific physical measures might be more relevant when applying this model to a breast cancer population. Future research should also measure whether women are perimenopausal during treatment as well as pre and post menopause.

Study Contributions

The potential role of exercise in improving functional and physical capacity has been examined (Winningham et al, 1989; Winningham & MacVicar, 1988; MacVicar & Winningham, 1986; Mock et al, 1994), but less research has specifically focused on the psychological implications of exercise with women treated for breast cancer (Nelson, 1991; Young-McCaughan & Sexton, 1991). This study has attempted to provide a better understanding of these implications in order to further assess the potential inclusion of cost-effective exercise programs as part of psychological as well as physical rehabilitation.

This study has also contributed to the exercise and breast cancer research by examining the relationships among exercise participation, body image, physical self efficacy, and self esteem in a single study. Establishing

relationships among these variables also provides an initial necessary step before completing research to determine causal relationships.

The use of the Exercise and Self Esteem Model as a theoretical framework also contributes to the research on exercise and breast cancer. It provides a theorized link between exercise and self esteem in a breast cancer population, and addresses concerns regarding past self esteem research with adult cancer patients (Curbow & Somerfield, 1991). In particular, specific components of global self esteem were assessed that may be influenced by the breast cancer treatment experience, and which may, in turn, influence the stability of global self esteem. These specific components may also unmask differences across the sample that may not necessarily have been uncovered by global measures of self esteem and exercise participation.

In general, support was found for the potential role of exercise in psychological recovery from breast cancer diagnosis and treatment. The Exercise and Self Esteem Model demonstrated that body image, physical self efficacy, and exercise participation are important contributors to self esteem in breast cancer survivors.

Table 1

Participants' Characteristics

Variable	N	% of Participants
Age*		
30-39 years	10	15.6
40-49 years	16	25.0
50-59 years	26	40.7
60-69 years	9	14.0
70-79 years	<u>3</u>	<u>4.7</u>
	64	100.0
Marital Status		
Never Married	1	1.6
Married	47	73.4
Common-Law	2	3.1
Separated	3	4.7
Widowed	1	1.6
Divorced	<u>10</u>	<u>15.6</u>
	64	100.0
Education		
Some High School	6	9.4
Completed High School	11	17.2
Some University/College	20	31.3
Completed University/College	21	32.8
Some Graduate School	2	3.1
Completed Graduate School	<u>4</u>	<u>6.3</u>
	64	100.0
Annual Family Income		
< \$20 000	4	6.3
\$20 000 - \$39 000	15	23.4
\$40 000 - \$59 000	19	29.7
\$60 000 - \$79 000	6	9.4
\$80 000 - \$99 000	7	10.9
> \$100 000	9	14.1
Missing	<u>4</u>	<u>6.3</u>
	64	100.0

Participants' Characteristics

Variable	N	% of Participants
Ethnic Origin		
British	31	48.4
French	2	3.1
Western Europe	8	12.5
Eastern Europe	1	1.6
Northern Europe	2	3.1
African	1	1.6
Other	3	4.7
Mixed	14	21.9
Missing	<u>2</u>	<u>3.1</u>
	64	100.0

* X = 50.81 years, SD = 9.83 years.

Table 2

Participants' Breast Cancer History

Variable	N	% of Participants
Stage of Disease		
Stage I	20	31.3
Stage II	21	32.8
Stage III	8	12.5
Stage IV	4	6.3
Don't Know	9	14.1
Missing	<u>2</u>	<u>3.1</u>
	64	100.0
Time Since Diagnosis*		
< 6 months	7	10.9
7 - 12 months	10	15.7
13 - 18 months	9	14.0
19 - 24 months	5	7.8
25 - 36 months	6	9.4
37 - 48 months	6	9.4
49 - 60 months	7	10.9
61 - 72 months	4	6.3
> 72 months	<u>10</u>	<u>15.6</u>
	64	100.0
Ongoing Treatment**		
Yes	21	32.8
No		
< 12 months	17	26.6
13 - 24 months	5	7.8
25 - 36 months	5	7.8
> 36 months	9	14.1
Missing	<u>7</u>	<u>10.9</u>
	64	100.0
Surgery		
Yes	63	98.4
No	<u>1</u>	<u>1.6</u>
	64	100.0
Chemotherapy		
Yes	42	65.6
No	19	29.7
Missing	<u>3</u>	<u>4.7</u>
	64	100.0

Participants' Breast Cancer History

Variable	N	% of Participants
Radiation Therapy		
Yes	39	60.9
No	24	37.5
Missing	<u>1</u>	<u>1.6</u>
	64	100.0
Menopause		
Pre-Menopausal During Treatment	33	51.6
Post-Menopausal During Treatment	18	28.1
Menopausal During Treatment	3	4.7
Missing	<u>10</u>	<u>15.6</u>
	64	100.0

* X = 51.06 months, SD = 64.50 months

** X = 24.51 months, SD = 52.02 months

Table 3

Exercise & Self Esteem Model Summary Statistics

Concept	Measure Outcomes	X	SD
Global Self Esteem	Total Self Esteem	33.91*	4.46
Physical Acceptance	Body Image	72.59 mm**	21.56 mm
Physical Competence	Physical Self Efficacy (PSES)	88.91***	13.87
	Perceived Physical Ability (PPA)	37.64****	8.21
	Physical Self-Presentation Confidence (PSPC)	51.27*****	8.17
Exercise Participation	Total Exercise	21.70 x/wk	16.63 x/wk
	Strenuous	0.47	1.14
	Moderate	2.06	2.17
	Mild	2.39	2.61

* Rosenberg Self Esteem Scale with possible range from 10 - 40.

** Body Image Visual Analogue Scale with possible range from 0 - 100 mm.

*** Physical Self Efficacy Scale with possible range from 22 - 132.

**** Physical Self Efficacy subscale with possible range from 10 - 60.

***** Physical Self Efficacy subscale with possible range from 12 - 72.

Table 4

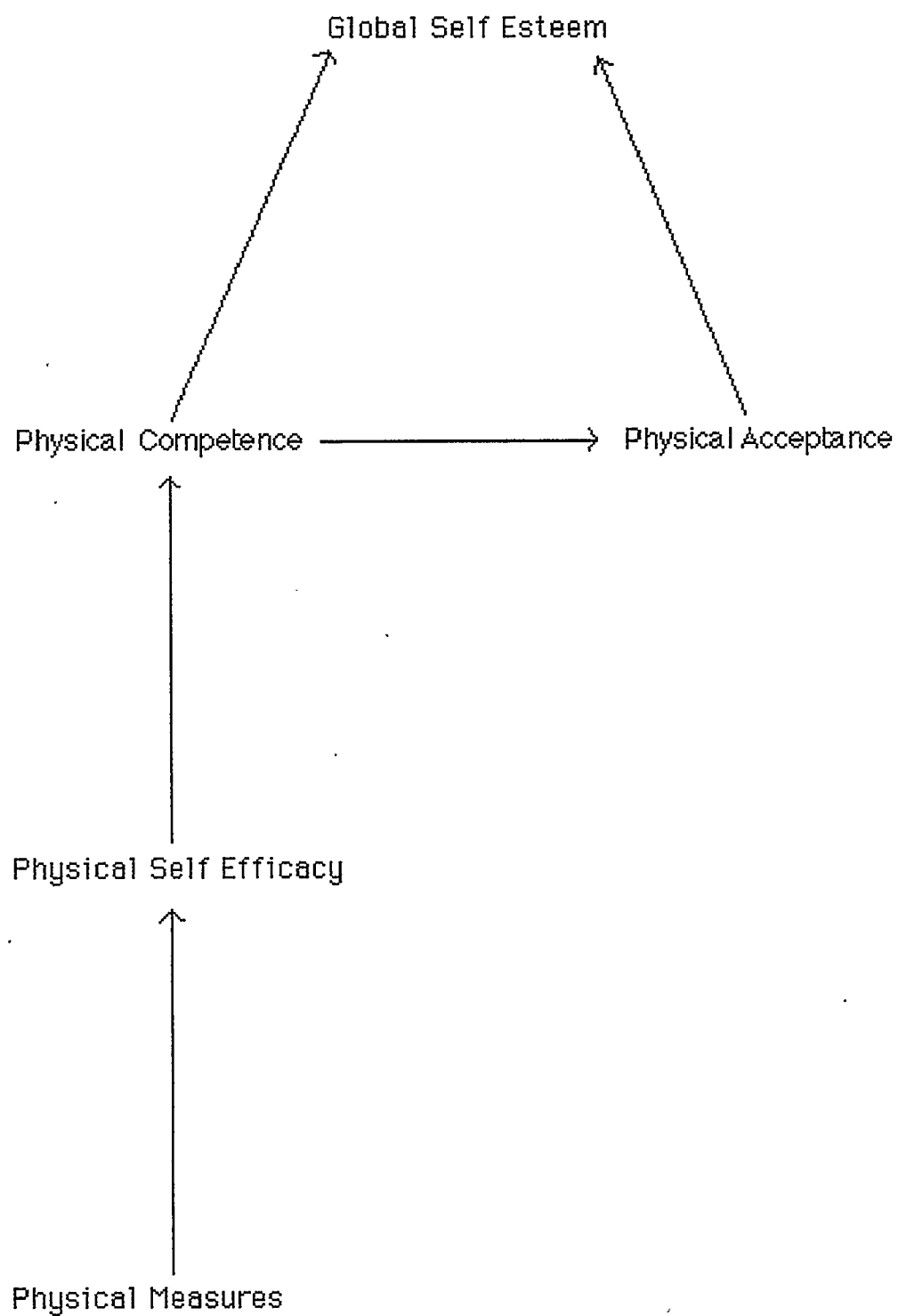
Exercise & Self Esteem Model Correlation Matrix

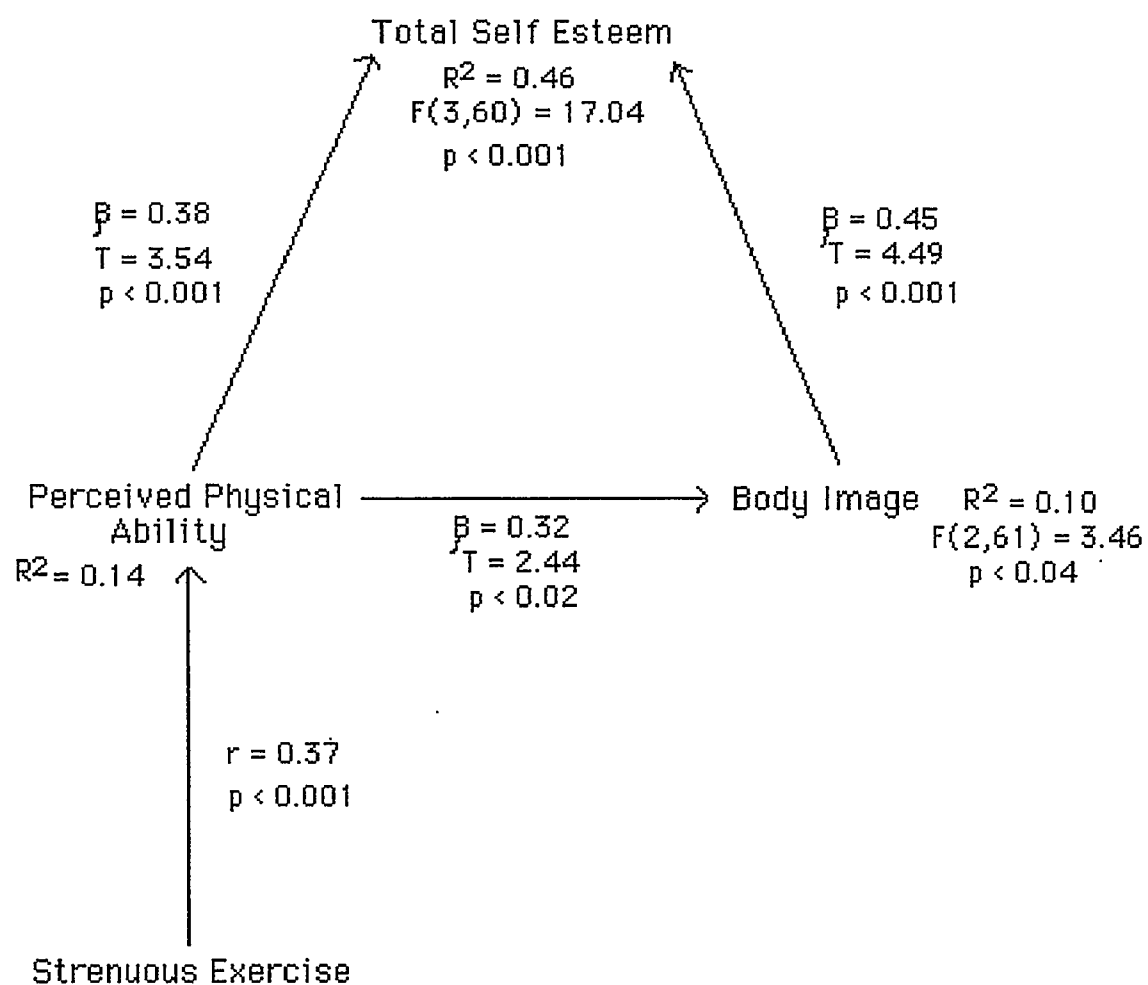
Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9
X1 Mild	---	.10	-.21*	.40***	.18	-.04	.08	.09	.05
X2 Moderate			.05	.73***	-.07	-.16	-.14	-.11	-.12
X3 Strenuous				.55***	.37***	.14	.30**	.12	.21*
X4 Total Exercise					.26*	-.04	.13	.05	.07
X5 Perceived Physical Ability (PPA)						.43***	.85***	.32**	.53***
X6 Physical Self Presentation Confidence (PSPC)							.85***	.46***	.65***
X7 Physical Self Efficacy (PSES)								.46***	.70***
X8 Body Image									.57***
X9 Total Esteem									---

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Figure 1. Exercise and Self Esteem Model as originally proposed by Sonstroem & Morgan (1989).

Figure 2. Path analysis of Exercise and Self Esteem Model using strenuous exercise to measure exercise participation, perceived physical ability to measure exercise competence, body image to measure physical acceptance, and total self esteem to measure global self esteem.





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Appendix A

Studies Examining Exercise and Breast Cancer

Study	Participants	Design	Procedure	Results
Young-McCaughan & Sexton, 1991.	71 women treated for breast cancer. No subject excluded due to disease stage, type of treatment or phase in treatment.	Retrospective design. Convenience sample identified from practices of participating physicians.	Pretested questionnaire mailed out. Cancer history, activities/exercise report, Quality of Life Index for Patients with Cancer, & Perceived Barriers to Exercise Scale were included.	59% classified as exercisers & 41% as non-exercisers. Exercisers had significantly higher quality of life, had always been active, & perceived significantly fewer barriers to exercise.
Nelson, 1991	54 women with Stage I breast cancer treated with modified radical mastectomy alone. 54 matched (age & family income) cohort of women.	Retrospective design. Random sample from tumor registry with physician approval provided for patient access. Cohort sampled from community groups.	Questionnaire mailed with followup cards sent out 2 weeks later. Rosenberg Self Esteem Scale, Exercise Benefits/Barriers Scale, & perceived health assessment were included.	Groups not significantly different on personal health perceptions, self esteem, & health-promoting behaviours, but significantly different on benefits & barriers to exercise. In breast cancer group, positive self esteem significantly related to positive perceptions of health, & health-promoting behaviours like exercise.
Mock, Burke, Sheehan, Creaton, Winningham, McKenney-Tedder, Schwager, & Liebman, 1994.	14 women with Stage I or II breast cancer in adjuvant cytotoxic chemotherapy.	Random assignment in clusters to experimental (n=9) (exercise & support group) or usual care (n=5) groups. Convenience sample from medical centres.	Experimental group received comprehensive rehabilitation program + usual care throughout chemotherapy treatment protocol. Psychosocial questionnaires administered before beginning, midway, & 1 month after protocol ended.	Experimental group exercised for min. 30 min. 3x/wk + throughout program. Usual care group decreased level of usual physical activity. Self concept scores consistent for both groups. Body image constant for experimental but decreased for usual care.

MacVicar & Winningham, 1986.	10 with breast cancer. 6 healthy but deconditioned women matched for age & weight.	Three group design with repeated measures. Exercisers (n=6) (experimental), non-exercisers (n=4), exercising control of healthy women (n=6).	Pre & post symptom limited graded exercise tests conducted. Experimental treatment consisted of progressive, aerobic interval training exercise program on bicycle ergometers. Profile of Mood States also used.	Exercising groups showed lower total mood disturbance. Exercising cancer patients improved functional capacity & reduction in nausea.
Winningham & MacVicar, 1988.	42 women with breast cancer receiving chemotherapy from university medical centre, medical clinics, & private practices.	Three group design with pre & post test measures. Matched on age & functional capacity, & randomized to experimental (exercise), placebo, & control.	Experimental group completed 3x/wk, 10 wk supervised aerobic interval-training cycle ergometer protocol. Placebo group did supervised flexibility & stretching exercises. Control group received no treatment.	Experimental group showed marked improvement in nausea compared to placebo or control groups, & significant improvement in somatization scores.
MacVicar, Winningham, & Nickel, 1990.	45 women with Stage II breast cancer on postsurgical chemotherapy protocols.	Three group design with pre & post test measures. Participants stratified by baseline functional capacity, & randomized to experimental (n=18) (exercise), placebo (n=11), & control (n=16).	Experimental group completed 3x/wk, 10 wk supervised aerobic interval-training cycle ergometer protocol. Placebo group did supervised flexibility & stretching exercises. Control group received no treatment.	Experimental group significantly improved pre to post test $\text{VO}_2\text{L}_{\text{max}}$, workload, & test time.
Winningham, MacVicar, Bondoc, Anderson, & Minton, 1989.	24 women with Stage II breast cancer.	Two group design with pre post test measures. Participants randomized to exercise treatment (n=12) or control (n=12).	Exercise treatment included 20-30 min/wk, 3x/wk at 60-85% of max HR on cycle ergometer for 10 wks. Control group received no treatment.	Exercise had underrating effect on body fat gain & altered subcutaneous body fat profile for both obese & non-obese participants.

Appendix B

Studies Examining Exercise and Self Esteem Model (EXSEM)

Studies	Participants	Design	Procedure	Results
Sonstroem, Harlow, Gemma, & Osborne, 1991	84 males & 61 females from cardiac rehabilitation program, community fitness program, & telephone & personal contact.	Retrospective design to test structural relationships within EXSEM.	Self Esteem Inventory & Global Self Worth Scale assessed self esteem. Estimation Scale & study-generated items assessed physical competence. Efficacy at walking, stair-climbing, & jogging also assessed. $VO_{2L_{max}}$ used for physical measure.	Hypothesized relationships between constructs are supported. Concluded that efficacy expectations specific to exercise tasks are generalized to physical competence which in turn influenced self esteem.
Sonstroem, Harlow, & Salisbury, 1993.	93 male interscholastic varsity swimmers.	Prospective design with repeated measures at pre, mid, & post season .	Global self esteem measured by Rosenberg Self Esteem Scale; perceived physical competence by Estimation Scale; Physical Self Efficacy by evaluation of specific personal swim skills; physical measures by swim performance.	Hypothesized relationships were supported. Significant improvements in performance, & three levels of self perception across swim season were demonstrated.

Sonstroem, Harlow, & Josephs, 1994.	216 adult female aerobic dancers contacted at aerobic dance classes.	Retrospective design to test expansion of EXSEM to include 2 levels of perceived physical competence.	General Self Worth Scale, Physical Self-Perception Profile, & single item self efficacy scales for jogging, sit-ups, & aerobic dancing were administered. Physical activity participation used as physical measure.	Essential hierarchy of EXSEM supported. Positive evaluations of physical condition & negative evaluations of body associated with exercise. Body & physical self worth scales suggested as acceptance rather than competence dimension.
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Appendix C

Background Information

Thank you for participating in this study. The following background information will be helpful in better understanding the women involved in this study.

Please complete the following general information:

1) Age: _____

2) Marital Status:

Never Married	_____	Separated	_____
Married	_____	Widowed	_____
Common Law	_____	Divorced	_____

3) Education:

Some High School	_____	Completed University/College	_____
Completed High School	_____	Some Graduate School	_____
Some University/College	_____	Completed Graduate School	_____

4) Annual Family Income:

< \$20 000	_____	\$60 000 - \$79 000	_____
\$20 000 - \$39 000	_____	\$80 000 - \$99 999	_____
\$40 000 - \$59 000	_____	> \$100 000	_____

5) Ethnic Origin:

To which ethnic or cultural groups did you or the majority of your ancestors belong on first coming to this continent?

_____ Aboriginal	_____ Southern Asia
_____ British	_____ Western Asia
_____ French	_____ Pacific Islands
_____ Western Europe	_____ Arab
_____ Eastern Europe	_____ Latin, Central, South American
_____ Northern Europe	_____ Caribbean
_____ Southern Europe	_____ African
_____ East and Southeast Asia	_____ Other
	(please specify): _____

Background Information cont'd

Please complete the following information on breast cancer history:

1) Stage of Disease:

I _____ II _____ III _____ IV _____ Don't Know _____

2) Time Since Diagnosis: Years _____ Months _____

3) Ongoing Treatment: Yes _____ No _____

If no, time since treatment: Years _____ Months _____

4) Type of Cancer Treatment:

a) Surgery Yes _____ No _____

Type of Surgical Procedure:

b) Chemotherapy Yes _____ No _____

Type of Chemotherapy:

c) Radiation Treatment Yes _____ No _____

Type of Radiation Treatment:

5) Pre-Menopausal during treatment: _____

Post-Menopausal during treatment: _____

Appendix D

Rosenberg Self Esteem Scale

The following questions concern the general perceptions that you currently have about yourself. Please indicate the number that best reflects your view. Use the following scale as your guideline.

1	2	3	4
Strongly Agree	Agree	Disagree	Strongly Disagree

- 1) On the whole, I am satisfied with myself. _____
- 2) At times I think that I am no good at all. _____
- 3) I feel that I have a number of good qualities. _____
- 4) I am able to do things as well as most other people. _____
- 5) I feel I do not have much to be proud of. _____
- 6) I certainly feel useless at times. _____
- 7) I feel that I am a person of worth, at least on an equal plane with others. _____
- 8) I wish I could have more respect for myself. _____
- 9) All in all, I am inclined to feel that I am a failure. _____
- 10) I take a positive attitude toward myself. _____

Appendix E

Body Image Visual Analogue Scale

The following scale will measure your own current satisfaction with your body image. A range from complete satisfaction to complete dissatisfaction of your body is indicated by the vertical line.

Please mark the line with an X at the point which indicates this degree of satisfaction.

Complete Satisfaction



Complete Dissatisfaction

Appendix F

Physical Self-Efficacy Scale

The next group of questions asks about your current perceptions of your physical self. Please indicate the number that best reflects your view. Use the following scale as your guideline.

1	2	3	4	5	6
Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
1) I have excellent reflexes.					_____
2) I am not agile and graceful.					_____
3) I am rarely embarrassed by my voice.					_____
4) My physique is rather strong.					_____
5) Sometimes I don't hold up well under stress.					_____
6) I can't run fast.					_____
7) I have physical disfigurements that sometimes bother me.					_____
8) I don't feel in control when I take tests involving physical dexterity.					_____
9) I am never intimidated by the thought of a desired sexual encounter.					_____
10) People think negative things about me because of my posture.					_____
11) I am not hesitant about disagreeing with people bigger than me.					_____
12) I have poor muscle tone.					_____
13) I take little pride in my ability in sports.					_____
14) Athletic people usually do not receive more attention than me.					_____
15) I am sometimes envious of those better looking than me.					_____
16) Sometimes my laugh embarrasses me.					_____
17) I am not concerned with the impression my physique makes on others.					_____
18) Sometimes I feel uncomfortable shaking hands because my hands are clammy.					_____

19) My speed has helped me out of some tight spots.

20) I find that I am not accident prone.

21) I have a strong grip.

22) Because of my agility, I have been able to do things which many others could not do.

Appendix G

Godin Leisure Time Exercise Questionnaire

The final questions concern your current participation in exercise.

Considering a typical week (7 days), how many times on the average did you do the following kinds of exercise for more than 20 minutes during your free time?

When considering the questions, please remember to:

- Consider a typical week (average).
- Only count exercise sessions that lasted 20 minutes or longer in duration.
- Only count exercise that was done during free time (ie. not occupation or housework).
- Note that the main difference between the three categories is the amount of effort required.

TIMES PER WEEK

a. STRENUOUS EXERCISE
(HEART BEATS RAPIDLY, SWEATING) _____

(ex. running, jogging, hockey, soccer, squash, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous dance classes, heavy weight training)

b. MODERATE EXERCISE
(NOT EXHAUSTING, LIGHT PERSPIRATION) _____

(ex. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular & folk dancing)

c. MILD EXERCISE
(MINIMAL EFFORT, NO PERSPIRATION) _____

(ex. easy walking, yoga, golf, archery, fishing, bowling, lawn bowling, shuffleboard, horseshoes, snowmobiling)

THANK YOU FOR TAKING THE TIME TO PARTICIPATE IN THIS STUDY.