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Utilising a Combined Exercise and Counselling Program to Examine the Relationship Between Emotional Self-Efficacy and Physiological Improvements in Breast Cancer Survivors

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ABSTRACT

Breast cancer diagnosis in women has increased in recent years, though medical progress has helped more patients become survivors rather than victims. With cancer diagnosis and treatment, however, comes a host of psychological and physical side effects that must be addressed. Research has found exercise and counselling may decrease the detrimental effects of breast cancer, but programs have typically utilised these modalities separately. As psychosocial issues appear correlated with physical health, it is imperative to examine the mind-body connection and explore the benefits of a combination exercise and counselling program. One psychological variable of interest is emotional self-efficacy, which relates to how capable one is of recognising and regulating emotions and may influence overall well-being and survival. This study explored if participation in such a program improved emotional self-efficacy and physiological health, and if self-efficacy levels correlated with other variables.

A 20-week intervention was utilised, consisting of two phases. During the first eight weeks, participants (n=19) were randomised among four groups: exercise-only (Ex; n=5), counselling-only (C; n=5), exercise and counselling (ExC; n=5), or usual care control (UsC; n=4). After these 8 weeks in separate intervention groups, all women were enrolled in exercise and counselling for the remaining 12 weeks of the 20-week study. Emotional self-efficacy and physiological parameters (cardiorespiratory endurance, upper and lower body strength, and flexibility) were assessed at baseline, 8 weeks, and 20 weeks. Non-parametric testing was utilised to examine between-group and within-group changes in the variables of interest.

Results indicated all groups were balanced at baseline for all parameters except age and radiation treatment. Eight-week findings indicated C, E, and ExC all improved emotional self-efficacy when compared to UsC (p=0.052), with the greatest score improvement observed in ExC (median=17.3). This finding suggests a program utilising both exercise and counselling may be most beneficial for improving self-efficacy. Additionally, both Ex and ExC improved in the physiological variables of interest compared to C and UsC, though only the increase in upper-body strength reached statistical significance (p=0.010). At the end of the 20 weeks, once all participants had undertaken at least 12 weeks of exercise and counselling, no
significant differences remained between groups. These results indicate a catch-up effect occurred, with 12 weeks of exercise and counselling sufficient to produce beneficial changes. No correlations were observed between adherence and emotional self-efficacy, while negative correlations were observed between baseline emotional self-efficacy scores and both overall self-efficacy changes and flexibility changes. No adverse effects or new or worsened cases of lymphoedema resulted from participation in the 20-week program.

Results from this study suggested combining exercise and counselling benefits both physical and psychosocial parameters, improving emotional self-efficacy more than exercise or counselling alone, with significant improvements achieved in a short time. Additionally, those with low emotional self-efficacy may have the most to gain from such an intervention. Findings from this study increased knowledge on the efficiency of a combined exercise and counselling program on addressing both physical and psychological side-effects of breast cancer. These findings can provide guidance for the implementation of such programs in the healthcare setting. Assisting post-treatment breast cancer patients to strengthen both their minds and bodies may help improve their overall quality of life and, ultimately, survivorship.
DECLARATION

I certify that this thesis does not, to the best of my knowledge:

(i) contain any material accepted for award of any other degree or diploma at another institute of higher education;
(ii) include any material previously published or written by another person, except where due reference is made in the text; or
(iii) contain any defamatory material.

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CHAPTER ONE

Introduction

In recent years, there has been a significant increase in the number of women diagnosed with breast cancer, both in Australia and worldwide. Australia figures have risen from 11,342 cases in 2000 to 12,170 in 2005 (Australian Institute of Health and Welfare [AIHW] & National Breast Cancer Centre [NBCC], 2006), while the worldwide rate has gone from 1,050,000 cases diagnosed between 1996-2000 to 1,290,000 diagnosed in 2007 alone (American Cancer Society [ACS], 2008; Steward & Kleihues, 2003). A recent publication by the AIHW and Australasian Association of Cancer Registries (AACR) projects that Australian figures will have risen to over 14,000 new cases per year by 2010 (2008). In addition, earlier detection and improvements in treatment, especially in developed countries, have also led to an increase in the number of survivors. Though breast cancer accounted for 15.8% of all female cancer deaths in 2005, one-year survival rates for Australian women were up from 93.2% between 1982-1986 to 96.7% between 1998-2004, and five-year survival has increased from 71.8% to 87.8% (AIHW & AACR, 2008; AIHW & NBCC, 2006).

With survival, however, comes a host of debilitating psychological and physical changes that must be addressed. Upon the conclusion of initial treatments, be it surgery, chemotherapy, radiation, or a combination of the above, women need both physical and psychological strength if they are to continue winning their fight against breast cancer. Psychological strength relates to a range of areas, from emotional and relationship issues to self-image and acceptance. Developing an approach that attends to both the psychological and physiological issues becomes essential in addressing the needs of this growing group of survivors, not only to aid in the recovery process, but also to enhance overall quality of life (Battaglini, Dennehy, Groff, Kirk, & Anton, 2006; Markes, Brockow, & Resch, 2006; Pinto, Trunzo, Reiss, & Shiu, 2002) and possibly survivorship (Holmes, Chen, Feskanich, Kroenke, & Colditz, 2005; Mills, Black, Campbell, Cardwell, Galway, & Donnelly, 2009). Psychological issues remain post-treatment, such as decreased body esteem and self-efficacy (Battaglini et al., 2006; Fleming & Kleinbart, 2001; Mosher et al., 2008;
Pinto & Trunzo, 2004; Wilmoth, Coleman, Smith, & Davis, 2004), depression and anxiety (Byar, Berger, Bakken, & Cetak, 2006; Schwartz, 2004), and decreased quality of life (Byar et al., 2006; Ganz et al., 2004; McInnes & Knobf, 2001; Milne, Gordon, Guilfoyle, Wallman, & Courneya, 2007; Milne, Wallman, Gordon, & Courneya, 2008; Pinto, Trunzo, Reiss, & Shiu, 2002).

Research has suggested that psychological distress often remains beyond diagnosis and treatment (Pinto, Clark, Maruyama, & Feder, 2003). The numerous physical changes resulting from breast cancer treatment typically have a psychological impact, with one key issue being decreased emotional self-efficacy. The concept of self-efficacy is defined as “judgements of how well one can execute courses of action required to deal with perspective situations” (Bandura, 1982). A diagnosis of breast cancer emotionally impacts every woman in a unique way. Giese-Davis and colleagues have found three primary areas of concern for most women are communicating emotions in relationships, maintaining focus on the present, and confronting anxieties about death and dying (2002). A woman’s ability to cope with these issues, and healthily regulate emotions in general, refers to her emotional self-efficacy. This concept is important to explore in relation to breast cancer, not only for psychological well-being, but also for its potential link with overall survival. Suppressed, repressed, or dysregulated emotional expression has been linked to increased incidence and progression of cancer (Geise-Davis et al., 2002), as well as greater mood disturbances (Palesh et al., 2006) and decreased physical activity levels (Mosher et al., 2008; Rogers et al., 2005) and overall quality of life (Han et al., 2005). A review conducted by Falagas and colleagues examining studies looking at the link between psychosocial factors and breast cancer survival found constraint of emotions was linked to decreased survival (2007). With the multitude of findings on the physical and psychological importance of high emotional self-efficacy, it becomes necessary to ensure that a biospsychosocial approach is taken in treating breast cancer patients.

The psychosocial effects of breast cancer diagnosis and treatment have been well-documented (Falagas, Zarkadoulia, Ioannidou, Peppas, Christodoulou, & Rafailidis, 2007; Fleming & Kleinbart, 2001; Giese-Davis & Spiegel, 2001; Koopman et al.,
as have the psychosocial benefits of exercise in both the general and breast cancer population (Bicego, Brown, Ruddick, Storey, Wong, & Harris, 2009; Pinto et al., 2002; Pinto et al., 2003). Though studies commonly assess the psychological impact of exercise, few exercise intervention studies have included a component like counselling, focused specifically on inducing psychological benefits. Quality of life has been measured in some studies, with findings suggesting exercise positively influences quality of life, but it is usually examined to see the link with physical improvements and functioning (Bicego et al., 2009; Campbell, Mutrie, White, McGuire, & Kearney, 2005; Ohira, Schmitz, Ahmed, & Yee, 2006; Segal et al., 2001). A few interventions have also examined depression levels (Mutrie et al., 2007) and self-esteem (Campbell et al., 2005; Courneya et al., 2007b; Daley, Crank, Saxton, Mutrie, Coleman, & Roalfe, 2007; Milne et al., 2008), again finding improvement trends favouring the exercise groups.

Further research is needed to explore other psychosocial benefits of exercise though, with a key issue being emotional self-efficacy. Self-efficacy levels have been found to correlate with physical functioning and activity levels, making it imperative to examine if improvement in one area will benefit the other parameter as well (Morris & Ingham, 1988; Mosher et al., 2008; Rogers et al., 2008; Valois, Umstattd, Zullig, & Paxton, 2008). Various types of self-efficacy have been studied in relation to physical activity. A study by Rogers and colleagues found a link between greater barrier and task self-efficacy and higher self-reported physical activity levels (2005). Additionally, positive correlations have been found between improvements in exercise self-efficacy and time spent exercising (Mosher et al., 2008). However, these types of self-efficacy are more related to physical abilities and confidence. Emotional self-efficacy and its response to physical activity has been examined in adolescents (Valois et al., 2008) and found to positively correlate. Those students who exhibited low emotional self-efficacy also tended to exhibit low physical activity levels, often not meeting recommendations for moderate, vigorous, or strengthening activity. As yet, it is unknown if breast cancer survivors with low emotional self-efficacy also exhibit low physical activity levels. This potential relationship is important to identify, as decreased physical activity levels have been linked to lower survival rates (Holmes et al., 2005). As the issues and barriers faced
by the breast cancer population are very different from those of adolescents, the need remains to assess emotional self-efficacy in this group, especially as related to exercise adherence and accrued physical benefits. This study aims to address this gap in the research.

As discussed earlier, some of the key factors found to be associated with lower emotional self-efficacy are low social support, decreased participation in treatment decisions, and increased mood disturbance. With one significant area of participation being treatment selection, women who choose to enrol in complementary therapies, specifically an exercise program, may improve their physical well-being and self-efficacy through becoming more proactive. When patients took a greater participatory role in their recovery, Morris and Ingham found they seemed to adjust better to work, remain optimistic about the future, strengthen self-efficacy, and improve physical and psychological functioning (1988). Engaging in an exercise program may allow women to develop a greater social support network as they interact with others familiar with their situation. Additionally, the positive effects of exercise on mood may assist in increasing emotional self-efficacy.

Providing post-treatment breast cancer patients with counselling may also increase emotional self-efficacy. A variety of intervention styles have been utilised to examine the impact of psychology-based treatments on breast cancer patients. Studies using approaches such as biofeedback (Childre & McCraty, 2001), expressive arts (Devine & Dattilo, 2000), and various recreational activities (Carruthers & Hood, 2004; Groff & Dattilo, 2000; Groff, Battaglini, O’Keefe, Edwards, & Peppercorn, 2007) have aimed to provide women with a way of acknowledging and expressing emotions, revealing mixed results on the impact of such interventions on overall psychological well-being. Supportive-expressive group therapy studies in both metastatic and newly diagnosed breast cancer patients have demonstrated increased emotional expression without greater accompanying hostility (Giese-Davis et al., 2002), decreased traumatic stress symptoms and mood disturbances (Classen et al., 2001), and unchanged or reduced distress and improved emotional regulation (Classen et al., 2007; Spiegel et al., 2007). A peer counselling study by Giese-Davis and colleagues found that newly diagnosed women increased
their emotional well-being and cancer self-efficacy after sessions with a peer who was further post-diagnosis (2006). Although only two of these interventions directly assessed emotional self-efficacy (Giese-Davis et al., 2002; Giese-Davis et al., 2006), with mixed results, all demonstrated promising improvements in a variety of parameters thought to be associated with emotional self-efficacy. More research is needed focused directly on emotional self-efficacy, specifically utilising a one-on-one counselling approach. This type of therapy allows a more individualised treatment to aid in greater recognition of one’s emotions and self-understanding, potentially translating into greater self-confidence and assertion (Greenberg & Foerster, 1996) and improved emotional expression (Giese-Davis et al., 2002).

During and following breast cancer treatment, women find themselves facing a multitude of physiological changes as well. Common issues arising are weight gain and altered body composition (Cheney, Mahloch, & Freeny, 1997; Costa, Varella, & Giglio, 2002; Demark-Wahnefried, Kenyon, Eberle, Skye, & Kraus, 2002; Demark-Wahnefried et al., 2001; Freedman et al., 2004; Garreau, DeLaMelena, Walts, Karamlou, & Johnson, 2006; Kroenke, Chen, Rosner, & Holmes, 2005; McInnes & Knobf, 2001; Nguyen, Stewart, Banerji, Gordon, & Kral, 2001; Partridge, Burnstein, & Winer, 2001; Rock et al., 1999; Schwartz, 2000; Wilmoth, Coleman, Smith, & Davis, 2004), decreased strength and functional capacity (Campbell, Mutrie, White, McGuire, & Kearney, 2005; Courneya, Segal, Mackey et al., 2007; MacVicar, Winningham, & Nickel, 1989; Partridge, Burnstein, & Winer, 2001; Segal et al., 2001), and fatigue (Battaglini, Dennehy, Groff, Kirk, & Anton, 2006; Byar, Berger, Bakken, & Cetak, 2006; Partridge, Burnstein, & Winer, 2001; Wilmoth et al., 2004). The number and intensity of side effects will vary for each woman based on factors like her prior health status, cancer staging, and, especially, treatment specifics. Different combinations of surgery, chemotherapy, radiotherapy, and hormone therapy, the primary treatment options, are used in each case of cancer, and all have been associated with their own host of common side effects (Battaglini et al., 2007; Brockstein, Smiley, Al-Sadir, & Williams, 2000; Cimprich, 1993; Helms, O’Hea, & Corso, 2008; Schneider, Dennehy, & Carter, 2003; Truong, Olivotto, Whelan, & Levine, 2004; Winningham et al., 1994).
Within the last few years, numerous studies have examined the impact of exercise interventions on various physical parameters related to women with breast cancer, utilising aerobic-based programs (Daley et al., 2007; Irwin et al., 2008), resistance-training programs (Ohira et al., 2006; Schmitz, Ahmed, Hannan, & Yee, 2005), and approaches incorporating both aerobic and resistance training (Battaglini et al., 2007; Campbell et al., 2005; Courneya et al., 2007; Hsieh et al., 2008; Milne et al., 2008; Mutrie et al., 2007; Schneider, Hseh, Sprod, Carter, & Hayward, 2007; Turner, Hayes, & Reul-Hirche, 2004). Meta-analyses have also been conducted in an attempt to summarise the multitude of existing research and make recommendations on effective interventions and future study directions (Courneya, 2003; Kim, Kang, & Park, 2009; Kirshbaum, 2006; Markes, Brockow, & Resch, 2006; McKneely, Campbell, Rowe, Klassen, Mackey, & Courneya, 2006; Visovsky, 2006). Based on findings from the individual studies and general conclusions from the meta-analyses, exercise benefits appear to outweigh the risks in the breast cancer population, regardless of treatment type or completion status, with aerobic and resistance training combination programs providing the widest range of benefits (Battaglini et al., 2007; Campbell et al., 2005; Courneya, 2003; Kim et al., 2009; Kirshbaum, 2006; Markes et al, 2006; McKneely et al., 2006; Mutrie et al., 2007; Visovsky, 2006). Most of the reviews stress the need for larger studies with longer intervention programs (average study length was around 3 months), more long-term follow-up on benefits, and increased discussion on adherence. The few studies that examined the correlation between exercise adherence and study endpoints found greater adherence was positively associated with greater physical improvements (Courneya et al., 2007; Milne et al., 2008). More research is needed in this area, as adherence seems to be important to accrue benefits. When participants are able to see positive changes, they may be more motivated to regularly participate in physical activity and reap the numerous health benefits seen in the research. Additionally, it is imperative to examine the influence of psychosocial parameters like emotional self-efficacy on adherence rates and to see if there exists a link between self-efficacy and accrued physiological improvements.

The combination of exercise and counselling may not only result in physical benefits, but also further improve emotional self-efficacy by helping the participant
learn healthy ways of expressing emotions and coping. It also provides another form of social support commonly seen to be lacking in those women with low emotional self-efficacy (Han et al., 2005). However, no studies have been conducted utilising both a psychological and physical type of treatment, making this study essential to determine the benefits of this kind of treatment approach.

**Purpose of Research**
The overall aim of this study is to investigate the impact of a combined exercise and counselling program on post-treated breast cancer patients’ overall physical and psychological well-being. Specifically, it seeks to explore if participation in a combined program will improve emotional self-efficacy more than partaking in either exercise or counselling alone. It also seeks to explore if a link exists between baseline self-efficacy levels and resulting physiological and psychological changes.

**Significance of Research**
The immediate and lasting symptoms observed in women post-breast cancer diagnosis have gained attention in the oncology arena, especially as survival rates have improved. Conventional exercise has been shown to assist in ameliorating both physical and psychological side effects developed following diagnosis and treatment. Additionally, psychosocial interventions such as counselling and group therapy have been demonstrated to assist in improving the psychological health of women with breast cancer. However, there is limited research taking a biopsychosocial approach and combining exercise with counselling. As psychosocial issues like low self-efficacy appear to have a link with physical health, it is imperative to develop a program that examines that link between mind and body. Findings from this study increased knowledge on the efficiency of a combined exercise and counselling program on addressing both physical and psychological side-effects of breast cancer. These findings can provide guidance for the implementation of such programs in the healthcare setting. Assisting post-treatment breast cancer patients to strengthen both their minds and bodies may help improve their overall quality of life and, ultimately, survivorship.
Research Questions

- Would combining exercise and counselling yield greater improvements in emotional self-efficacy compared to the exercise-only protocol?
- Would combining exercise and counselling yield greater improvements in emotional self-efficacy compared to the counselling-only protocol?
- Would the four treatment groups exhibit catch-up results in emotional self-efficacy scores after all are enrolled in exercise and counselling after the first eight weeks?
- Was there a correlation between physical and psychological improvements and baseline emotional self-efficacy levels?
- Was there a correlation between exercise adherence and emotional self-efficacy?

Hypothesis

As little research exists on the effect of either exercise or one-on-one counselling on emotional self-efficacy in breast cancer patients, it was difficult to make an evidence-based hypothesis. However, based on the factors that seem to constitute and influence emotional self-efficacy, it was hypothesised that the exercise and counselling combination groups would exhibit greater improvements over the first eight weeks than the exercise only, counselling only, or usual care control group. This hypothesis was based on the expectation that counselling would help ease distress by allowing for healthy expression of emotion and providing a form of social support, while exercise would further benefit emotional self-efficacy due to the positive effects of physical activity on mood. Additionally, the exercise only and counselling only groups would improve more than the usual care control group, but not significantly differ from one another. By the conclusion of the 20-week program, after all individuals had been enrolled in both exercise and counselling for at least 12 weeks, it was expected that all groups would have significantly improved emotional self-efficacy, with no significant differences between any of the groups.

Based on recent research, it was hypothesised that, during the first eight weeks, the exercise-only and combination exercise and counselling group would significantly improve physical fitness compared to the counselling-only and usual care groups. At
the conclusion of the five-month intervention, all four groups would significantly improve physical fitness. However, the exercise-only group and combination group would still have improved significantly more than the counselling-only and usual care groups due to 20 weeks of exercise compared to just 12 weeks.

Finally, it was hypothesised that higher self-efficacy levels would correlate with both greater exercise adherence and larger overall improvements, based on the existing research on self-efficacy and physical activity.
CHAPTER 2

Literature Review

Breast Cancer Psychosocial Side Effects

Often, the time following diagnosis is filled with concerns about the diagnosis itself, what treatment to undergo and potential side effects, and worries about the future and mortality (McInnes & Knobf, 2001). These worries may manifest into depression, anger, anxiety, strained relationships and a host of other psychosocial issues, but may also physically result in problems such as fatigue, body ache and sleeping difficulties (Byar, Berger, Bakken, & Cetak, 2006; Berger & Farr, 1999; Eversley, Estrin, Dibble, Wardlaw, Pedrosa, & Favila-Penney, 2005; Manuel et al., 2007). As treatment is undergone and finished, additional fears and concerns commonly arise. These may include worries about having or raising children, altered body image and sexuality and work ability (Avis, Crawford, & Manuel, 2004; Fleming & Kleinbart, 2001; Schain, d'Angelo, Dunn, Lichter, & Pierce, 1994). These stressors may continue well past the conclusion of treatment, especially as the physical side effects confirm some of these fears.

In a review of studies examining the psychosocial needs of breast cancer patients, Schmid-Büchi and colleagues found common needs related to physical and social impairments from breast cancer treatment, such as fatigue, menopausal symptoms, and altered body image, as well as emotional distress, linked to issues like depression and fear of recurrence (2008). The included studies involved women ranging from 3 to 30 months post-diagnosis, so these needs exist in both current patients and post-treatment women. A study by Ganz and colleagues undertaken with long-term survivors found areas of concern significantly impacting quality of life had shifted from what they were in the initial year (1996). More current issues now included problems with body image and weight, sexual interest and function and disrupted general activity levels. Another study examining unmet needs of survivors five to six years post-diagnosis found around two-thirds of women no longer reported moderate or high support need (Girgis, Boyes, & Hansen, 2008). However, those women who did report unmet needs usually related their issues to psychological and daily living issues.
Additionally, the physical changes resulting from treatment often exacerbate these psychological issues. The relationship between physical and psychological works in the reverse as well, with psychological issues seemingly capable of producing or heightening physical problems. McInnes and colleagues found that women who experienced greater weight gain during the first year since starting chemotherapy exhibited higher levels of distress, as assessed by the Linear Analog Self Assessment Symptom Distress Scale for Breast Cancer (2001). The amount of weight gained was also positively associated with how bothered the woman was by this increase, as measured with the FACT-B scale (item 41-“I am bothered by a change in weight”). However, overall quality of life, as measured by the FACT-B, was not significantly affected by weight gain during the first year. A more longitudinal study looking at issues of concern in long-term survivors found body image concerns often arose or increased two to three years after treatment, once women had time to deal with more immediate issues such as the initial shock of diagnosis, treatment decisions and side effects of treatment (Ganz, Coscarelli, Fred, Kahn, Polinsky, & Petersen, 1996).

As these physical changes often continue, and potentially even worsen, two to three years after treatment, more research is needed on the physical and psychosocial connection and ways to help women address these issues (Ganz et al., 1996; Girgis, Boyes, & Hansen, 2008). It is essential to recognise that once a woman has completed standard hospital-based care, her need for treatment does not end as well. Instead, a new approach must be taken that focuses on helping her psychologically recover from the debilitating impact of both cancer itself and the life-saving treatment.

**Self-efficacy.** Long-term side effects of cancer treatment, such as decrease in functional ability, difficulties with beginning new relationships or expressing oneself in existing ones, and feelings of lack of control, may also translate into decreased self-efficacy (Ganz, Coscarelli, Fred, Kahn, Polinsky, & Petersen, 1996; Han et al., 2005). The concept of self-efficacy has been defined by Bandura as “judgements of how well one can execute courses of action required to deal with perspective situations” (1982). Higher self-efficacy translates into a greater sense of control over
one’s situation and actions, whether this control actually exists or is merely perceived. Studies have found individuals in the general population with greater self-efficacy are more likely to set difficult goals and expend the effort needed to overcome obstacles and achieve them (DeVellis & DeVellis, 2000). Han et al. state that as women struggle to address the overwhelming range of physical and psychological changes arising after a breast cancer diagnosis, their emotional self-efficacy, or personal belief in their own ability to face and handle “emotionally challenging situations,” is certain to be challenged (2005, p. 320). Figure 1 presents a clearer outline of the concept of self-efficacy, different types, and what is suggested to correlate with emotional self-efficacy, the specific type explored in the current study.

![Figure 1. Self-efficacy summary chart](image)

Emotional self-efficacy is a relatively new concept, related to a woman’s coping and emotion regulation abilities. Positive correlations have been demonstrated between self-efficacy and psychological factors such as mood and perceived quality of life (Cunningham, Lockwood, & Cunningham, 1991), as well as physical functioning
and activity levels (Morris and Ingham, 1988; Mosher et al., 2008; Rogers et al., 2005; Valois et al., 2008). Other psychological issues arising from breast cancer diagnosis and treatment may contribute to decreased emotional self-efficacy. In a world where appearance is so highly scrutinised, physical changes seen with breast cancer often lead to a more negative outlook on body image and general psychological distress (Demark-Wahnefried et al., 2002; Fleming & Kleinbart, 2001; Han et al., 2005; Helms, O'Hea, & Corso, 2008). Deformity or loss of one or both breasts may negatively affect not only a woman’s physical functioning but also her psychosocial well-being. As the breast has a societal connotation of femininity and sexuality, any alteration or loss may impact areas like confidence, identity, and esteem (Helms et al., 2008; Khan, Sehgal, Mitra, Agarwal, Lal, & Malik, 2000). This may affect a woman’s social relationships, one of the key issues suggested to impact emotional self-efficacy (Giese-Davis et al., 2002).

Another common physical change women with breast cancer experience is a gain in fat mass without equivalent gains in lean body mass. Breast cancer patients in the 1987 Psychological Aspects of Breast Cancer Study Group exhibited self-depreciation, inadequate body image, and weight gain (Pinto et al., 2003). Additionally, weight gain has been linked to development of other comorbidities, such as diabetes and cardiorespiratory disease, as well as heightened disease progression and poorer outcome (Giese-Davis & Spiegel, 2003; Weihs, Enright, Simmens & Reiss, 2000). Awareness of these risks, coupled with physical changes, has been shown to negatively impact self-esteem and quality of life and increase feelings of distress (Helms et al., 2008), and is also likely to impact emotional self-efficacy as it relates to issues of confronting death and dying (Giese-Davis et al., 2002). Studies have suggested that part of this weight gain may be associated with psychological variables, such as coping style (Kumar et al., 1997). One way of avoiding emotions may be turning to food rather than people. Levine and colleagues concluded that, regardless of treatment regime, there seemed to be a link between a woman’s weight gain and a decrease in emotional self-efficacy, or ability to express her emotions (1991).
When emotional self-efficacy was examined in the doctor-patient relationship, it was found that a better ability to communicate with physicians helped improve overall quality of life (Engel, Kerr, Schlesinger-Raab, Eckel, Sauer, & Holzer, 2003). Women who viewed these relationships as negative tended to have greater problems coping (Alder and Bitzer, 2003) and lower emotional self-efficacy (Han et al., 2005). Higher emotional self-efficacy has been suggested to correlate with a more proactive approach to seeking information, and therefore feeling greater satisfaction with medical interactions (Han et al., 2005). Bulsara and colleagues found women who experienced more positive interactions with their healthcare team felt more empowered and better able to manage their illness (2008). The doctor-patient relationship, and its potential relation to a woman’s self-efficacy, has been explored in conjunction with social support. Han and colleagues found women who viewed themselves as receiving adequate social support were less likely to have a negative view of medical interactions (2005). Additionally, Collie and colleagues suggested that women who experience unsupportive interactions with friends and family may feel unable to voice concerns to health professionals (2005). This decreased emotional self-efficacy could negatively impact the woman’s recovery and overall well-being, as she becomes unable to express any fears or worries about her health.

Lower emotional self-efficacy has also been linked to increased mood disturbance, with emotional suppression correlating with higher levels of depression and anxiety in both advanced-stage breast cancer patients (Classen, Koopman, Angell, & Spiegel, 1996) and those recently diagnosed (Watson et al., 1991). Emotional inhibition is known to heighten the cardiorespiratory system’s sympathetic, or stress, response (Gross & Levenson, 1997), and long-term suppression has been suggested to relate to the progression of cancer (Gross, 1989; Jensen, 1987).

Every individual’s experience of breast cancer diagnosis and treatment is different, as are the resulting side effects of cancer and method of addressing them. As a result, the degree to which each woman’s emotional self-efficacy is impacted is certain to vary, making it necessary to recognise a patient’s particular stressors and develop an approach that can be tailored to each woman (Manuel et al., 2007). This becomes especially important as findings suggest suppression, repression or
dysregulation of emotional expression may be linked to an increase in incidence and progression of cancer (Giese-Davis et al., 2002; Gross, 1989; Jensen, 1987).

**Self-efficacy and psychosocial therapies.** As emotional self-efficacy is a psychosocial construct, utilising some form of psychological therapy may be effective in improving it. A recent meta-analysis by Zimmerman and colleagues examined 56 studies exploring the effectiveness of various psychosocial interventions in breast cancer patients (2007). Groups involved in the studies were both homogeneous (breast cancer patients only) and a mixture of breast and other cancer patients, with a variety of intervention methods utilised: psychoeducation, relaxation, cognitive-behavioural and supportive. In regards to treatment administration, some interventions were led by one or more health professionals (psychologist, social worker, nurse), while others were led by peer breast cancer survivors. Those interventions found to be most effective were heterogeneous in relation to cancer type (p<0.001), psychoeducational (p<0.05), led by a health professional, specifically a psychologist rather than nurses (p<0.001), individual instead of group interventions (p<0.001), involving women with early stage over advanced stage disease (p<0.001) and done right after diagnosis or surgery rather than during treatment (p<0.01) or months to years post-diagnosis (p<0.001). The researchers also looked at the overall effect size of psychological interventions and concluded that, as previous meta-analyses have also found, they are beneficial for reducing emotional distress in adult patients.

A review study examining the effect of psychosocial interventions on breast cancer survival found mixed results after examining six studies conducted between 1989 and 2001 (Falagas et al., 2007). Varying types of interventions were used, but only two of the six studies found those in the intervention group lived significantly longer than those in the control. One of these studies involved patients with metastatic breast cancer and used weekly group therapy sessions, while the other one enlisted Stage I patients receiving health psychology classes. Additionally, this systematic review concluded social support, minimising, denial, and marriage were all associated with better cancer prognosis, while depression and emotional constraint were linked to decreased survival. Though no direct reference was made to general
therapy impact on emotional self-efficacy, factors such as social support and emotional constraint are linked to this concept. A finding that these matters are associated with cancer prognosis highlights the need for further study in this area, expanding the research to directly include self-efficacy.

Another literature review summarised the impact of interventions on other key parameters related to emotional self-efficacy, such as coping or control skills and social relationships (Newell, Sanson-Fisher, & Savolainen, 2002). Overall, they have found group therapy appears beneficial for improving coping or control skills, and approaches like cognitive behavioural therapy, communication skills training, and relaxation training warrant further study. In relation to improving social relationships, both structured and unstructured counselling may provide long-term benefits.

An examination of individual studies reveals both group therapy and counselling approaches have been utilised with breast cancer patients, examining emotional self-efficacy or measuring factors thought to influence it. Such recent studies are summarised in the table below (Table 1).
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Treatment</th>
<th>Outcomes</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classen et al., 2001</td>
<td>n=125 Metastatic bc women (64 in intervention, 61 in control group)</td>
<td>*3-15 women in 1 year SET led by 2 therapists *compared to self-directed educational control group</td>
<td>*therapy sign. ↓ traumatic stress symptoms ↑ TMD for patients not in last year of life</td>
<td>*no measure of ESE</td>
</tr>
<tr>
<td>Classen et al., 2007</td>
<td>n=353 primary bc women</td>
<td>*groups of up to 10 in 12-wk SET, 1x/wk, led by 2 therapists *compared to educational control group (publically-accessible info from ACS)</td>
<td>*no sign. group diff. in TMD or self-efficacy *after SET, most highly distressed had greatest improvement in anxiety &amp; depression</td>
<td></td>
</tr>
<tr>
<td>Fukui et al., 2000</td>
<td>n=46 Japanese primary bc women</td>
<td>*6-10 women led by psychiatrist &amp; clinical psychologist, 1x/wk for 6wks *compared to wait-list control</td>
<td>*Sign. ↓ in TMD in therapy group ↑ in fighting spirit (coping ability)</td>
<td>*no measure of ESE *cultural differences b/t Asian &amp; Western societies limit generalisibility</td>
</tr>
<tr>
<td>Giese-Davis et al., 2002</td>
<td>n=see above</td>
<td>*3-15 women in 1 year SET led by 2 therapists *compared to self-directed educational control group</td>
<td>*therapy sign. ↓ repression of negative affect, ↑ restraint *only 65 patients with ESE data → therapy group unchanged, control ↓</td>
<td>*need to assess ESE in non-metastatic bc patients</td>
</tr>
<tr>
<td>Lieberman et al., 2003</td>
<td>n=32 bc women of predominately rural/medium-size towns</td>
<td>*16-wk online weekly group discussion led by trained therapist *coping data compared to those who dropped out after 1+ meeting</td>
<td>*↓ depression levels and pain reaction, ↑ parts of PGI *drop-outs more fatalistic, less capable of coping w/ anxiety, fewer perceived positive social changes</td>
<td>*no measure of ESE</td>
</tr>
<tr>
<td>Giese-Davis et al., 2006</td>
<td>n= bc women (43 newly diagnosed, 39 av. 52.2 months post-diagnosis)</td>
<td>*new patient paired w/ post-diagnosis peer counsellor, 1-4x/wk for 3-6 months</td>
<td>*new patients ↓ trauma symptoms, ↑ cancer SE, desire for info, emotional well-being *counsellors ↑ emotional repression, dissatisfaction w/ med interactions *no sign. change in ESE</td>
<td>*emotional expression &amp; active coping main topics discussed, linked to ESE</td>
</tr>
</tbody>
</table>

Abbreviations: bc, breast cancer; sign., significant; TMD, Total Mood Disturbance; ESE, emotional self-efficacy; PGI, Posttraumatic Growth Inventory; SET, supportive-expressive therapy; ACS, American Cancer Society; av., average; SE, self-efficacy

Based on findings from recent psychosocial interventions, further research is warranted on the impact of such treatments on emotional self-efficacy. Most studies did not directly assess emotional self-efficacy, and the two that did emphasised the need for additional exploration of this parameter (Giese-Davis et al., 2002; Giese-Davis et al., 2006). The outcomes commonly assessed, such as mood disturbance and distress symptoms, were typically shown to benefit from therapy and have commonly been suggested to correlate with emotional self-efficacy (Classen at al., 2001). Directly measuring this parameter will help clarify whether psychosocial therapy can help women improve their self-efficacy levels. Also, more research is needed on women with primary rather than metastatic breast cancer, especially those who are further post-diagnosis or post-treatment, due to the potential differences in psychosocial issues faced and response to therapy. Most studies have utilised a form
of group therapy to address affect regulation. However, as each woman differs in her methods of coping and regulating emotions, a program using a one-on-one counselling approach is justified. As peer counsellors struggle with their own lingering cancer-related psychosocial issues, potentially decreasing their ability to provide adequate guidance on how to cope with such problems, such counselling may be most affective when delivered by a professional counsellor.

**Self-efficacy and physical activity.** With the potential negative impact of decreased self-efficacy on quality of life and, ultimately, survivorship, it is essential to examine ways of increasing one’s self-efficacy. One potential method may be through physical activity interventions. A survey conducted using West Australian breast cancer survivors found that only 31% of survivors were obtaining the recommended amount of physical activity post-treatment (Milne et al, 2007). Those that were meeting guidelines, however, reported a significantly higher quality of life (p<0.001, assessed using the FACT-B) than those not obtaining recommended levels of activity. Also, regardless of activity levels, those women with healthy BMI values (<25.0) scored significantly higher on the FACT-B quality of life assessment (p=0.058) than those classified as obese (BMI≥30). Pinto and colleagues conducted a one-year study tracking exercise participation of early stage breast cancer patients, and its subsequent impact on mood, quality of life and correlated symptoms (2002). Like Milne, they found most women were getting below the recommended amount of physical activity, with 35% of the participants not meeting guidelines at any of the five assessments over the year. Those few who did meet guidelines, however, exhibited a significantly higher degree of physical functioning, but no significant difference in mood or cancer symptoms.

Physical activity has been examined in relation to both general self-efficacy and self-efficacy subtypes, such as exercise self-efficacy, task self-efficacy, and emotional self-efficacy. Exercise self-efficacy relates to one’s confidence in planning and carrying out physical activity. Studies with young adults have found that this form of self-efficacy appears to have a greater relation to physical activity uptake and maintenance than other psychosocial determinants, such as social support and outcome expectations (Dzewaltowski, Noble, & Shaw, 1990; Rovniak, Anderson,
Winett, & Stephens, 2002). A study with healthy female undergraduate students found those with higher general self-efficacy felt more energised during exercise and more refreshed and positively engaged following activity bouts than peers exhibiting low self-efficacy scores (Bozoian, Rejeski, & McAuley, 1994). Enjoyment and perceiving benefits of exercise is essential for long-term adherence, which has important implications for the current study as physical activity uptake has been positively associated with survival in breast cancer patients (Holmes et al., 2005).

A mail survey by Rogers and colleagues examined correlates of both barrier self-efficacy and task self-efficacy in breast cancer survivors (2008). Task self-efficacy relates to one’s confidence in ability to perform an activity (i.e. exercise), while barrier self-efficacy is perceived ability to overcome barriers to activity participation. Based on the survey responses, they found higher task self-efficacy directly associated with lower fatigue and greater social support and activity enjoyment, while higher barrier self-efficacy correlated with the same three factors, as well as pre-diagnosis physical activity and perceived exercise barriers. Another important finding from this study was that higher current physical activity levels were directly associated with increased barrier self-efficacy and task self-efficacy. Better social support and higher pre-diagnosis activity levels also predicted higher current activity levels. As emotional self-efficacy is partly reliant on perceived social support (Collie et al., 2005; Han et al., 2005), it may also influence physical activity levels. That correlation was not examined in this study and therefore warrants exploration.

Though no studies could be found that directly examined the relationship between exercise and emotional self-efficacy in breast cancer patients, some research has been conducted in other groups. Valois and fellow researchers examined the link between self-reported physical activity and emotional self-efficacy levels in adolescents (2008). Regardless of gender, significant relationships were found to exist between low emotional self-efficacy and not meeting recommendations for vigorous or strengthening physical activity. It could not be concluded if low physical activity levels were a result of having low emotional self-efficacy, or if the relationship was reversed, but findings support the idea that a link exists between exercise and emotional self-efficacy. As very little research currently exists
exploring this link, especially in the breast cancer population, further research on this relationship may help fill this gap in the literature. Identifying breast cancer survivors with lower emotional self-efficacy may give an indication of who is at a higher risk of having low physical activity levels and potentially struggle to adhere to a program like the one in the current study.

**Self-efficacy and adherence.** Regardless of how beneficial a program may be, it must be adhered to for benefits to accrue. Research has suggested that one factor potentially influencing a participant’s adherence is self-efficacy. Table 2 presents a summary of studies conducted on the link between adherence and self-efficacy.

Table 2

<table>
<thead>
<tr>
<th>Study</th>
<th>Details</th>
<th>Outcome</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison &amp; Keller, 2004</td>
<td>*older adults tested 6wks &amp; 12wks post-cardiac event *self-efficacy coaching (SECI) over phone, standard telephone follow-up, &amp; UC group</td>
<td>*all groups ↑ SE over 12wks *SECI highest mean distance walked on 6MWT at end of 12wks</td>
<td>*possible that ↑ SE → ↑ PA adherence → ↑ fitness, but further study warranted *as SE is a psychosocial parameter, worthwhile to examine if face-to-face coaching would have stronger impact than telephone coaching used in study</td>
</tr>
<tr>
<td>Karvinen et al., 2007</td>
<td>*endometrial cancer survivors *survey to examine factors associated w/ exercise motivation and behaviour</td>
<td>*higher SE independently correlated w/ better exercise intention &amp; behaviour</td>
<td>*need to examine if increasing SE can improve PA adherence in older &amp; obese survivors *examine if increasing ESE can help increase psychosocial confidence to engage in more activity</td>
</tr>
<tr>
<td>McAuley, Lox, &amp; Duncan, 1993</td>
<td>*examined SE &amp; adherence in older adults *partaking in graded exercise testing 9 months after 5-month exercise program</td>
<td>*decline in physical performance &amp; SE from conclusion of exercise to 9-month follow-up point</td>
<td>*higher exercise SE → higher self-directed exercise adherence during 9-month follow-up period, emphasising need to monitor and promote long-term adherence</td>
</tr>
<tr>
<td>Pinto, Rabin, &amp; Dunsiger, 2009</td>
<td>*breast cancer survivors *12wk home-based exercise program on predictors of adherence *measured minutes of exercise/wk, weekly # of steps, &amp; meeting individual weekly exercise goals</td>
<td>*at end of 12wks, baseline exercise SE score predicted all 3 adherence outcomes *higher baseline SE → better adherence *adherence in achieving weekly goals declined after initial weeks regardless of SE</td>
<td>*no SE measures taken after baseline, so unclear if link b/t goal adherence decline and change in SE levels</td>
</tr>
<tr>
<td>Rovniak, Anderson, Winett, &amp; Stephens, 2002</td>
<td>*examined PA in university students for 8wk period</td>
<td>*higher exercise SE → more PA adherence *perceived social support indirectly influenced PA levels</td>
<td>*Implication for ESE b/c social support thought to influence this (Han et al., 2005) *need to examine link b/t ESE and exercise adherence, esp in high-risk group where PA linked to survivorship (Holmes et al., 2005)</td>
</tr>
</tbody>
</table>

Abbreviations: PA, physical activity; SE, self-efficacy; ESE, emotional self-efficacy; UC, usual care; 6MWT, 6-minute walk test
Though these studies have provided useful information in relation to self-efficacy and its relationship to exercise participation and adherence, further study is warranted to examine if patients with poorer adherence also exhibit lower improvements or even negative changes in self-efficacy. This is important because decreased physical activity has been associated with poorer disease prognosis, so monitoring and attempting to increase self-efficacy may ultimately have positive implications for survival (Holmes et al., 2005).

**Breast Cancer Physical Side Effects**

Breast cancer, along with the methods of treatment, creates a range of physical side effects that patients must endure in addition to the disease itself. Typical care includes a combination of local therapy, which is surgery with or without radiotherapy, and systematic adjuvant therapy, be it chemotherapy, hormone therapy or a combination of the two (Markes et al., 2006). Depending on the type of adjuvant treatment the patient undergoes, if any, he or she faces the potential of an array of both short- and long-term side effects. Short-term effects are typically experienced while treatment is being received, tending to clear up within months of completion; however, long-term effects may not appear until post-treatment and have the potential to last for years following therapy (Partridge et al., 2001). Treatment options and common side effects are summarised in the table below (Table 3).
Table 3

*Treatments and Associated Side Effects*

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td><em>lumpectomy=isolated lump removal, retainment of surrounding breast</em>&lt;br&gt;<em>mastectomy=removal of one/both breasts and associated tissue</em>&lt;br&gt;<em>scarring, altered body image (Fleming &amp; Kleinbart, 2001)</em>&lt;br&gt;<em>fatigue (Cimprish, 1993)</em>&lt;br&gt;<em>strength loss (Schneider, Dennehy, &amp; Carter, 2003)</em>&lt;br&gt;<em>decreased range of motion (Battaglini et al., 2007)</em>&lt;br&gt;<em>fatigue, skin erythema, fatigue (Truong, Olivotto, Whelan, &amp; Levine, 2004); decreased activity, strength loss, functional capacity→greater fatigue (Winningham et al., 1994)</em>&lt;br&gt;*short-term: fatigue, nausea, emesis, stomatitis, alopecia, myalgias, neuropathy, myelosupression, thromboembolism&lt;br&gt;<em>long-term: premature menopause, weight gain, fatigue, cardiac &amp; cognitive dysfunction (Partridge, Burnstein, &amp; Winter, 2001)</em>&lt;br&gt;<em>both chemo and radiotherapy linked to cardiorespiratory &amp; pulmonary toxicity, decreased endurance, greater fatigue, anxiety, depression (Brockstein, Smiley, Al-Sadir, &amp; Williams, 2000; Schneider et al., 2003, Spiegel et al., 2007)</em>&lt;br&gt;<em>combo=intensified effects on muscular &amp; cardiopulmonary systems (Bezwada, Granick, Long, Moore, Lackman, &amp; Weiss, 1998)</em>&lt;br&gt;*both associated w/ hot flashes, weight gain, insomnia, joint aches, sexual functioning issues, though AIs associated w/ less recurrence and longer disease-free survival&lt;br&gt;*Tamoxifen (TAM) common choice for premenopausal&lt;br&gt;*Aromatase inhibitors (AIs) available for postmenopausal&lt;br&gt;<em>TAM mimicks effects of oestrogen and prevents bone loss, while AIs block oestrogen synthesis &amp; associated w/ higher osteoporosis &amp; fracture risk (Garreau et al., 2006)</em></td>
</tr>
<tr>
<td>Radiotherapy</td>
<td><em>brachial plexopathy (form of peripheral neuropathy), skin erythema, fatigue (Truong, Olivotto, Whelan, &amp; Levine, 2004); decreased activity, strength loss, functional capacity→greater fatigue (Winningham et al., 1994)</em></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>*for women with oestrogen receptor-positive breast cancer&lt;br&gt;*Tamoxifen (TAM) common choice for premenopausal&lt;br&gt;*Aromatase inhibitors (AIs) available for postmenopausal&lt;br&gt;*short-term: fatigue, nausea, emesis, stomatitis, alopecia, myalgias, neuropathy, myelosupression, thromboembolism&lt;br&gt;<em>long-term: premature menopause, weight gain, fatigue, cardiac &amp; cognitive dysfunction (Partridge, Burnstein, &amp; Winter, 2001)</em>&lt;br&gt;<em>both chemo and radiotherapy linked to cardiorespiratory &amp; pulmonary toxicity, decreased endurance, greater fatigue, anxiety, depression (Brockstein, Smiley, Al-Sadir, &amp; Williams, 2000; Schneider et al., 2003, Spiegel et al., 2007)</em>&lt;br&gt;<em>combo=intensified effects on muscular &amp; cardiopulmonary systems (Bezwada, Granick, Long, Moore, Lackman, &amp; Weiss, 1998)</em>&lt;br&gt;*both associated w/ hot flashes, weight gain, insomnia, joint aches, sexual functioning issues, though AIs associated w/ less recurrence and longer disease-free survival&lt;br&gt;<em>TAM mimicks effects of oestrogen and prevents bone loss, while AIs block oestrogen synthesis &amp; associated w/ higher osteoporosis &amp; fracture risk (Garreau et al., 2006)</em></td>
</tr>
<tr>
<td>Hormonal therapy</td>
<td>Many of these treatment side effects may not manifest during or immediately after usual care concludes. Treatment-related fatigue, the most commonly experienced symptom, has been reported by up to 99% of women during treatment, with more than 60% rating it as moderate to severe (Jacobsen, Hann, Azzarello, Horton, Balducci, &amp; Lyman, 1999). Fatigue has been shown to negatively impact not only physical aspects of daily life, but also result in psychosocial, cognitive, and socioeconomic issues (Holley, 2000; Hsieh et al., 2008). Another key side effect of treatment that exerts much longer-term consequences is weight gain and altered body composition. Not only does this physical issue threaten functional ability and immediate health, but it may also impact breast cancer recurrence and survival as well. A recent study involving over 5000 patients found a positive association between weight gain and higher recurrence and mortality rates, especially in never-smokers and premenopausal women (Kroenke et al., 2005). Goodwin and colleagues also examined the link between weight and recurrence of breast cancer, focusing on BMI values (2002). They found those women who had a BMI between 20 and 25 kg/m$^2$ faced a lower recurrence risk, while the risk steadily increased as BMI surpassed 25 kg/m$^2$. Weight gain in any individual, not just those with breast cancer, can have a detrimental effect on overall health. As weight increases, so does the risk</td>
</tr>
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</table>
for developing chronic illnesses such as diabetes, hypertension, and cardiorespiratory disease (Visorsky, 2006).

As many of the physical side effects of breast cancer become more detrimental or arise after standard hospital-based care concludes, a need exists to recognise that care cannot stop once treatments like surgery or chemotherapy conclude. Additionally, women may face uncertainty about what sort of activity they can engage in without exacerbating these side effects and potentially decrease or cease exercise completely (Winnigham, 1991). To help alleviate this fear and hesitation, survivors should be offered advice on how to safely address these issues if they are to increase their functional ability, overall quality of life, and, most importantly, disease-free survival.

**Exercise and physical side effects.** Numerous studies have been conducted examining the impact of varying physical activity interventions on improving the physical well-being of breast cancer patients and survivors. A host of recent literature reviews and meta-analyses have attempted to summarise the findings of these trials and provide recommendations for further research (Table 4).
### Table 4

**Summary of Physical Activity Literature Reviews and Meta-Analyses**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Studies examined</th>
<th>Findings</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| Kim, Kang, & Park, 2009 | 10 studies on cardiopulmonary function and BC improvements w/ bc women during & after adjuvant therapy | *n=8 AET, 2 AET/RET: improved cardio improved after exercise  
*n=7 on cardio, all showed BC improvements w/ BC women during & after adjuvant therapy  
*n=5 on BC, saw sign. ↓ in %BF  
*average adherence of 87.4% (n=6 studies) | *utilise combination AET/RET programs  
*emphasise to participants importance of long-term adherence |
| Kirshbaum, 2006 | 29 studies w/ bc women during & after adjuvant therapy | *all AET studies: exercise effective to ↓ cancer-related fatigue  
*unclear how beneficial to other concerns (sleep, self-esteem, etc) | *important to include non-aerobic components in a program for body image and general well-being  
*need to address issue of patient motivation |
| Markes, Brockow, & Resch, 2007 | 9 studies w/ bc women during adjuvant therapy | *n=7 AET, 2 AET/RET: ↑ cardio fitness, nausea relief, ↓ anxiety, sleep disturbance  
*no sign. changes in fatigue, weight, QOL, depression, strength, immune function, mood | *need consistency in measurement tools (ie hard to examine parameters like psychosocial distress bc inconsistence quantification)  
*adherence important to address b/c key for program success  
*create programs w/ exercise variety  
*address self-efficacy to promote behaviour change and better adherence |
| McKneely et al., 2006 | 14 studies w/ bc women during & after adjuvant therapy | *n=8 AET, 6 AET/RET: exercise benefits QOL, physical functioning, peak O\(_2\) consumption, fatigue  
*no significant change in weight or BMI (n=6)  
*4 studies reporting adverse effects ⇒ no lymphoedema; mainly back/shoulder injuries | *more detail needed when reporting exercise prescription  
*better monitoring of adherence & adverse effects |
| Visovsky, 2006 | 11 studies w/ bc women during chemotherapy | *n=6 RET, 5 AET/RET: exercise beneficial to physical functioning, QOL, but not strength and BC  
*RET did not induce or worsen lymphoedema | *combined AET/RET program likely most beneficial  
*need longer-term programs (15+ wks)  
*include more diverse & neglected populations (obese, older women) |

Abbreviations: BC, body composition; bc, breast cancer; AET, aerobic exercise training; RET, resistance exercise training; %BF, percent body fat; QOL, quality of life; BMI, body mass index.

In conclusion, meta-analyses and reviews looking at various exercise interventions in breast cancer patients have found exercise beneficial and safe. Specifically, programs that combine aerobic and resistance training appear most capable of combating the negative physiological impacts of breast cancer treatment, such as decreased strength, cardiorespiratory fitness, and lean body mass and increased body fat and weight gain. Since much of the weight changes in women with breast cancer are in the form of sarcopenic obesity, with fat mass gained and lean body mass lost, simple aerobic exercise may not be enough to reverse this change. The addition of resistance training to a physical activity regime is commonly recommended to effectively produce body composition changes and prevent or counteract sarcopenic obesity (Heber, Ingles, Ashley, Maxwell, Lyons, & Elashoff, 1996). Additionally, longer-term programs are desirable to allow both physical and psychological changes.
time to arise, as well as interventions that better monitor adverse effects. Since a program will only be successful if it is adhered to, more research is needed that both monitors participation and examines its link to other parameters to find potential ways of increasing this program adherence.

**Physiological impact of aerobic and resistance training programs.** As interventions utilising both aerobic and resistance training components appear the most beneficial to women with breast cancer, it is important to examine the recent programs that have taken this approach. Reviewing other programs is important in aiding to design a study that aims to address some of the gaps in the research and determine whether similar designs exist to allow for evaluation of program effectiveness (Table 5).
### Summary of Aerobic and Resistance Training Programs

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Treatment</th>
<th>Outcomes</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battaglini et al., 2007</td>
<td>n=20 recently diagnosed bc women (10 UC, 10 exercise)</td>
<td>AET &amp; RET 2x/wk for 21wks</td>
<td>*exercise group ↑ strength, LBM, ↓ %BF vs. UC</td>
<td>↑100% adherence *no psychosocial measures</td>
</tr>
<tr>
<td>Campbell et al., 2005</td>
<td>n=19 bc women undergoing chemo/radiation (10 UC, 12 group exercise)</td>
<td>AET/RET group exercise 2x/wk for 12wks + behavioural change theme 1* 6wks</td>
<td>*exercise group ↑ physical functioning, self-reported PA, general QOL *average adherence of 70%</td>
<td>*many women kept exercising together after 12-wk study *no measure of parameters covered in behavioural change seminars (ie self-efficacy)</td>
</tr>
<tr>
<td>Courneya et al., 2007</td>
<td>n=242 bc women in adjuvant treatment (82 UC, 82 RET, 78 AET)</td>
<td>AET &amp; RET groups exercise 3x/wk for chemo + 3 wks after</td>
<td>*AET ↑ self-esteem, fitness, ↓ %BF vs. UC *RET ↑ self-esteem, strength, LBM, chemo completion rate vs. UC *higher adherence &amp; psychosocial ↑</td>
<td>*aerobic and resistance training separated, need to see benefits of combo program</td>
</tr>
<tr>
<td>Demark-Wahnefried et al., 2002</td>
<td>n=9 bc women receiving chemo in intervention, compared to 36 historic controls</td>
<td>AET 3-5x/wk, lower-body RET 2-3x/wk for 6 months</td>
<td>*↓ body mass, %BF, fat mass vs. controls *diet counselling, but component not analysed *exercise adherence self-reported</td>
<td>*no psychosocial factors assessed in conjunction w/ observed body comp changes *self-reported adherence vulnerable to mis-estimating PA</td>
</tr>
<tr>
<td>Hecht et al., 2008</td>
<td>n=96 bc women, groups based on treatment (surgery, surgery+chemo, surgery+radiation, or all three)</td>
<td>AET &amp; RET 2-3x/wk for 6 months</td>
<td>*↑ cardio functioning: group w/ all 3 ↓ RHR, ↑ pulmonary function *↑ groups with surgery + other treatment ↓ fatigue domains</td>
<td>*no monitoring of adherence *no control, so unsure if changes typical during weeks post-treatment or a result of program</td>
</tr>
<tr>
<td>Milne et al., 2008</td>
<td>n=58 post-treat bc women (29 IEG, 29 DEG)</td>
<td>*IEG w/ 12wks supervised AET/RET → 12wks follow-up w/ 4 phone calls *DEG w/ 12wks phone calls, no led exercise → 12wks AET/RET</td>
<td>*w/ 12wks of supervised exercise, both groups ↑ QOL, aerobic fitness, strength, ↓ fatigue, SPA *shift from extrinsic to intrinsic motivation to exercise, correlated w/ better psych needs satisfaction *↑ adherence correlated w/ greater physical &amp; QOL ↑</td>
<td>*no report of IEG PA levels during 2nd 12wks of study when unsupervised</td>
</tr>
<tr>
<td>Mutrie et al., 2007</td>
<td>n=203 bc women undergoing chemo/radiation (102 UC, 101 group exercise)</td>
<td>AET/RET group exercise 2x/wk for 12wks + behavioural change theme 1* 6wks</td>
<td>*exercise group ↑ physical functioning, shoulder mobility, self-reported PA, QOL, positive mood *improvements continued at 6-month follow-up w/ exception of PA</td>
<td>*no measure of parameters covered in behavioural change seminars (ie self-efficacy) *adherence not reported</td>
</tr>
<tr>
<td>Schneider et al., 2007</td>
<td>n=113 bc women in or done with treatment</td>
<td>AET &amp; RET 2-3x/wk for 6 months</td>
<td>*↑ systolic BP, ↑ time on treadmill; post-treat ↑ lung function tests *↓ all ↓ behavioural, sensory, total fatigue; post group ↓ psych-based fatigue components (affective, cognitive/mood)</td>
<td>*no monitoring of adherence</td>
</tr>
<tr>
<td>Turner, Hayes, &amp; Reul-Hirche, 2004</td>
<td>n=10 bc women post-surgery/ chemo</td>
<td>AET 1x/wk, RET added mid-program, for 8wks</td>
<td>↑ QOL at end of program &amp; 3-month follow-up *trends suggesting ↓ fatigue, ↑ mood &amp; general well-being *no ↑ lymphoedema</td>
<td>↑100% adherence &amp; self-reported ↑ exercise confidence &amp; enjoyment &amp; body image *peer support deemed one of greatest benefits</td>
</tr>
</tbody>
</table>

Notes: bc, breast cancer; UC, usual care; RET, resistance exercise training; AET, aerobic exercise training; %BF, percent body fat; LBM, lean body mass; BP, blood pressure; RHR, resting heart rate; QOL, quality of life; PA, physical activity; IEG, immediate exercise group; DEG, delayed exercise group; SPA, social physique anxiety

Based on these recent studies, it seems essential to utilise an exercise program combining exercise and resistance training to best elicit positive physical changes.
Parameters commonly impacted by cancer treatment, such as strength, cardiorespiratory endurance, and body composition, all appear to benefit most from combination programs rather than those using just aerobic or resistance training. Longer-term programs that are monitored for intensity and adherence are desirable, as well as interventions that examine links to such adherence. Even with the physical benefits reported in the studies little was mentioned about the psychological impact of such improvements. More research is needed exploring the link between taking a physical approach to rehabilitation and the effect on mental and emotional health.

**Conclusion**

Both psychosocial and physiological parameters are negatively impacted by diagnosis and treatment of breast cancer. The end of treatment does not mean the conclusion of side effects as well, with some issues even intensifying. However, there is evidence that interventions may alleviate these negative effects. Emotional self-efficacy, one psychosocial parameter affected by breast cancer, has primarily been addressed through group or peer counselling. Most of these interventions have only indirectly studied emotional self-efficacy though, and often used metastatic patients or women still in treatment. A need remains to directly assess emotional self-efficacy, especially in post-treatment women, and utilise one-on-one counselling, recognises the fact that each individual’s issues and experience are unique. Additionally, links have been suggested between varying types of self-efficacy and both program adherence and physical activity and well-being. These relationships need to be explored for emotional self-efficacy, specifically in the breast cancer population rather than adolescents or the elderly.

In relation to physical improvements, exercise programs combining aerobic and resistance training seem most effective in producing positive changes. A need remains for longer-term programs that monitor adherence and adverse effects. Additionally, research is lacking on the psychological benefits exercise interventions may produce on areas like self-efficacy. Though emotional self-efficacy may correlate with physical improvement, very little research has monitored this psychosocial parameter during physical activity.
interventions. Programs have shown counselling may produce psychosocial benefits, while exercise generates physical and psychological improvements, but the two modalities have been used in isolation. An approach is necessary that recognises the benefits of both types of programs and combines them in an attempt to accrue even greater all-around improvements (Mills et al., 2009). As little is known about the feasibility and efficiency of such a multi-modal program, the proposed study is necessary.
Methodology

Subject Characteristics

Twenty-one women between the ages of 30 and 75 years volunteered and were eligible for participation in this study. Participants were initially recruited from oncology specialists, Cancer Council WA and cancer support groups operating in Perth. Additional recruitment was then done using informational fliers distributed to local breast care clinics and via word of mouth from other program participants and involved staff.

Inclusion criteria for participation were:

- Female with confirmed diagnosis of Stage I, II or III invasive breast cancer;
- Between the ages of 30 and 75 years;
- Completed with all planned surgery, chemotherapy and/or radiation therapy;
- Participants receiving adjuvant hormonal therapy or trastuzumab (Herceptin) were still eligible.
- Apparently healthy, based on PAR-Q and physician approval;
- Not currently involved in a structured exercise or diet program.

Criteria for exclusion from the study included:

- Acute or chronic bone, joint, or muscular abnormalities that would compromise ability to participate in the exercise rehabilitation program;
- Metastatic disease;
- Immune deficiency that would compromise the participant’s ability to participate in the exercise testing;
- Unable to understand written or verbal English.

No inclusion or exclusion criteria were included related to mental health. Upon referral to the program, participants contacted the program director to determine preliminary study eligibility. This eligibility was based on meeting the inclusion criteria outlined above and being able to commit to the program attendance requirements. Any individual deemed ineligible following this phone call was given information on other gym-based exercise programs and local services. Those individuals meeting eligibility criteria were then mailed a package including: a
consent form, clearance form to be signed by an oncologist or personal GP, medical history, pre-evaluation guidelines, Physical Activity Readiness Questionnaire (PAR-Q) and four questionnaires used to establish a baseline psychological level (Appendix A). The questionnaires utilised were the Stanford Emotional Self-Efficacy Scale-Cancer to measure emotional self-efficacy, the Piper Fatigue Scale to assess fatigue levels, the Beck Depression Inventory (BDI) to determine depression level and the Functional Assessment of Cancer Therapy-Breast (FACT-B) to assess quality of life. Once participants had completed the questionnaires and obtained approval from their oncologist or GP, a facility visit was scheduled to ensure eligibility and, if appropriate, conduct a baseline physiological assessment and group randomisation.

**Study Design**

This study utilised a randomised four-group design consisting of an exercise-only group (Ex, n=5), a counselling-only group (C, n=5), a combination exercise and counselling group (ExC, n=5) and a delayed treatment usual care control group (UsC, n=6). Participants were randomised to each group on a rolling enrolment basis, for a total of twenty-one participants in the study. Each group had eight weeks in their allocated group of either counselling-only, exercise-only, exercise and counselling, or usual care. After these 8 weeks, all participants spent the remaining 12 weeks undertaking both exercise and counselling, regardless of their initial group assignment. This resulted in a total intervention time of twenty weeks (Figure 2).

![Figure 2. 20-week group allocation](image-url)
This design was chosen for ethical and retention reasons. By having eight weeks of group-specific treatment, it was possible to have a control group and assess the treatment-specific benefits of counselling separately, exercise separately, and the two modalities combined. Enrolling all participants in exercise and counselling during their remaining 12 weeks prevented any participants not initially in the exercise and counselling group from feeling mislead. In other words, participants interested in the program believed they were going to receive both exercise and counselling, so it was deemed important to offer this opportunity during the second half of the program to maintain participant interest and trust.

Assessment
General fitness and psychological assessments were conducted on all participants prior to commencing the intervention program, at the eight-week mark and upon completion of the five-month intervention. These assessments included obtaining measurements of the dependent variables (emotional self-efficacy, body composition, cardiorespiratory endurance, strength, and flexibility), along with other physiological and psychological parameters monitored for additional research purposes outside of this study. All assessments were conducted at the Institute of Health and Rehabilitation Research on the campus of the University of Notre Dame-Australia in Fremantle, Western Australia. Ethical approval for all testing procedures was obtained from the university’s Human Research Ethics Committee.

Procedures
Psychological assessment. Subjects completed the first of three psychological assessments prior to visiting the study facility and meeting the program coordinators (Appendix B). This was done in an attempt to minimise the impact of seeing the facility and meeting the researcher on obtaining a baseline psychological state. Evaluation was done via mail, with each participant receiving a packet of questionnaires after an initial phone conversation with the program director to confirm eligibility. Psychological parameters assessed included the dependent variable of emotional self-efficacy, along with three other parameters:

1) Emotional self-efficacy (Stanford Emotional Self-Efficacy Scale-Cancer)
2) Depression (Beck Depression Inventory)
3) Fatigue (revised Piper Fatigue Scale)
4) Overall quality of life (Functional Assessment of Cancer Treatment-Breast)

The Stanford Emotional Self-Efficacy Scale-Cancer (SESES-C) was utilised to assess emotional self-efficacy (Giese-Davis et al., 2004). This 15-item scale assesses a patient’s confidence in three domains: communicating emotions in relationships, focusing on the present moment and confronting death and dying. It uses a Likert-type scale from 0-100, in increments of 10, ranging from ‘not at all confident’ to ‘completely confident’. Total score is determined by calculating the mean response across all 15 items. Validity for use in the cancer population was assessed and supported with three studies, examining scale structure, concurrent and predictive validity and generalisability (Giese-Davis et al., 2004). Test-retest reliability over a three-month period has also been demonstrated (r=0.80-0.95) for both the subscales and total score (Giese-Davis et al., 2002).

Depression levels were measured with the Beck Depression Inventory (BDI) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), which asks 21 questions assessing varying aspects of depression. Each question has four to five statements of increasing severity, and scores for each item range from zero to three. Total scores fall between 0 and 26, with a higher score corresponding to a higher degree of depression. Studies have found this is a suitable tool for assessing depression in general practice, when health professionals may not be of a psychology background (Salkind, 1969).

To assess fatigue, the revised Piper Fatigue Scale was used (Piper, Dibble, Dodd, Weiss, Slaughter, & Paul, 1998). There are four subscales to this questionnaire, each assessing a different component of fatigue: behavioural subscale, affective subscale, sensory subscale, and cognitive and mood subscale. The patient is presented with 22 questions in total, and the average score represents the total fatigue score. Each question is answered by the patient circling a number best describing their current status, with the Likert scale ranging from 0 (none) to 10 (a great deal) of fatigue.
A higher overall average score corresponds with a greater level of fatigue. This assessment tool has a standardised Cronbach alpha of 0.97 and subscale reliability ranging from 0.92-0.96 (Piper et al., 1998; Hsieh, Sprod, Hydock, Carter, Hayward, & Schneider, 2008).

The Functional Assessment of Cancer Therapy-Breast (FACT-B) was utilised to assess participant quality of life (Cella et al., 1993; Brady et al., 1997). This instrument is composed of 44 items and consists of the FACT- General (FACT-G) plus the Breast Cancer Subscale (BCS), which assesses issues specific to quality of life in breast cancer. Studies with breast cancer patients have concluded this tool is suitable for use in clinical practice, with sufficient test-retest reliability, a high alpha coefficient (alpha =0.90) and subscale alpha coefficients ranging from 0.63 to 0.86 (Brady et al., 1997).

A reassessment was then conducted at the eight-week mark of a participant’s program by issuing the questionnaires at the session prior to their mid-program physiological assessment and collecting them on testing day. A final assessment was done at the completion of the overall five-month intervention, with participants being issued the questionnaires at the session prior to their final day and returning them upon attending the last session.

**Physiological assessment.** Upon entry into the study, all participants underwent a baseline physiological assessment prior to commencing the program (Appendix C). This battery of tests measured the following parameters:

1) Resting vitals (resting heart rate-RHR, blood pressure-BP, and pulse oximetry for determination of haemoglobin saturation
2) Height, weight, and Body Mass Index (BMI)
3) Body circumferences
4) Body composition (skinfolds)
5) Cardiorespiratory endurance (\( \dot{V}O_{2\text{max}} \))
6) Muscular strength (YMCA Bench Press and 1-RM Leg Press)
7) Flexibility (Sit-and-reach)
These assessments were also completed at the eight-week mark of each participant’s program, and following completion of the full five-month intervention. The protocol used for each of these assessments is presented in the following sections.

**Resting vitals, height and weight.** Upon the participant’s arrival, each was instructed to relax in a chair while answering questions pertaining to cancer treatment history, other medical conditions and history, and exercise history. Resting heart rate and haemoglobin saturation were then determined utilising a Nonin Onyx pulse oximeter (Minnesota, USA), and a 3M™ Littman stethoscope (Minnesota, USA) and blood pressure cuff were used to gain a resting blood pressure. Following the obtainment of resting vitals, participants were instructed to remove their shoes in order to obtain a height and weight measurement using a wall-mounted stadiometer for height and an A&D Weighing scale (California, USA). These two values were then used to calculate the participant’s BMI utilising the equation: weight (kg)/height$^2$ (m$^2$).

**Body circumferences and skinfolds.** After measuring resting vitals, body circumferences and skinfold measurements were taken. Circumferences were obtained at the following sites:

1) Gluteus—most prominent part of the gluteal region
2) Waist—smallest part of the torso, above the umbilicus and below the xyphoid process
3) Abdominal—level with the umbilicus
4) Upper arm (both)—widest part of the arm between the elbow and shoulder
5) Lower arm (both)—widest part of the arm between the wrist and elbow
6) Thigh (both)—widest part of the leg between the knee and groin

A seven-site skinfold measurement was then done to determine percent body fat. The seven sites used were: triceps, chest, subscapular, midaxilla, abdomen, suprailiac, and thigh (Jackson, Pollock, & Ward, 1980). All measurements were taken on the side of the unaffected breast. Due to a double mastectomy, a three-site
skinfold measurement was conducted on one of the women to determine percent body fat, using the triceps, suprailiac, and thigh. For both the seven- and three-site tests, each site was measured in a rotational order until two measurements were obtained for each site. Any areas with consecutive measurements more than 2 mm apart were measured for a third time (American College of Sports Medicine [ACSM], 2006). After obtaining an average for each site, the sum of the sites was plugged into an equation devised by Jackson and colleagues to determine body density (1980). This value for body density was then used in an age-specific equation developed by Heyward and Wagner to calculate percent body fat (2004).

Care was taken to ensure skinfold measurements were a reliable reflection of participant body fat. Whenever possible, the same researcher conducted measurements for the participant’s three assessments. This was done in an attempt to minimise the amount of between-technician error, which has been found to be greatest for measurements of the abdomen and thigh (Lohman, Pollock, Slaughter, Brandon, & Boileau, 1984). When care is taken to minimise measurement error, skinfold measurements have been demonstrated to produce similar values for subcutaneous fat as those found by magnetic resonance imaging (Hayes, Sowood, Belyavin, Cohen, & Smith, 1988).

Cardiorespiratory endurance. Cardiorespiratory endurance was assessed using the Modified Bruce Treadmill Protocol, a multistage, variable speed and elevation treadmill test used to estimate $\dot{V} O_{2\text{max}}$. The test begins with a 3-minute warm-up stage of 0% incline and 2.74 kph speed, with speed, incline or both then increased every 3 minutes (Lerman, Bruce, Sivarajan, Pettet, & Trimble, 1976). Testing stops when the participant reaches 75% of their maximum heart rate ($[220-\text{age}] \times 0.75$) or requests to stop. A F4 Polar Heart Rate Monitor (Kempele, Finland) was used to monitor each participant’s heart rate during testing.

The Modified Bruce protocol was chosen to assess cardiorespiratory endurance due to the population being tested. Participants tended to be higher risk for physical and deconditioned, so the use of a maximal exercise test such as the Bruce protocol was deemed unsafe. A study by McInnis and Balady (1994) found similar physiological
responses in heart rate and blood pressure when comparing the Bruce and the Modified Bruce protocols. When using submaximal exercise tests to predict $\dot{V}O_{2max}$, research has shown values tend to be underestimated for untrained, inactive individuals (Heyward, 2006). Additionally, the Modified Bruce protocol’s reliance on an age-predicted heart rate maximum may result in a 10-15% error in $\dot{V}O_{2max}$ prediction (Heyward, 2006, p. 67). Despite these limitations, submaximal tests can still provide a relative idea of baseline fitness while not increasing the risk to the participant.

**Muscular strength.** The YMCA Bench Press test was utilised to estimate upper-body muscular strength (Golding, 1989). Participants were positioned supine on a flat bench and given a 35-lb (15.9 kg) bar. They then performed as many repetitions as possible at a set cadence of 30 repetitions per minute, with pace established using a metronome. Testing was stopped when the participant could no longer maintain the exercise cadence or chose to stop (Kim, Mayhew, & Peterson, 2002). Due to its attempt to control for repetition duration and posture alignment, ACSM views this test as having high reliability (2006).

A 1-RM leg press test was utilised to assess lower-body dynamic strength. Using a seated leg press set at a 45-degree angle, the participant was fitted on the machine and allowed to warm up by completing five repetitions at 40 to 60% of their estimated 1-RM. A one-minute rest was then given, during which the participant was instructed to stretch the muscle group. This was followed by three to five repetitions of the leg press at 60 to 80% of the estimated 1-RM. Weight was then increased, and a 1-RM lift was attempted. If successful, the woman was given a three-minute rest before attempting the next weight increment. This procedure was repeated until a 1-RM value was obtained. All attempts were made to achieve this weight within three to five trials (Heyward, 2006). Precautions were made to ensure testing was done as safely as possible. The researcher ensured each participant had an adequate warm-up before attempting the 1-RM lift and closely monitored the lift to ensure correct technique and breathing. When properly administered, the 1-RM leg press provides a valid measure of lower-body strength (ACSM, 2006).
A handgrip dynamometer was utilised to assess static grip strength. The grip was adjusted to a position comfortable for the individual. The participant was then made to stand erect, with the arm straight and slightly abducted, shoulder adducted and neutrally rotated, forearm in the neutral position and wrist in slight extension (Canadian Society for Exercise Physiology [CSEP], 2003). Once positioned, the woman used on brief maximal contraction to squeeze the handgrip, avoiding any extraneous body movement. Two trials were conducted with each hand, and the highest score was recorded as static strength.

**Flexibility.** To assess flexibility, the standard box sit-and-reach test was used (ACSM, 2006). Participants completed this following the muscular endurance and strength assessments to minimise the risk of muscle pulls potentially resulting from attempting to stretch cold muscles. The test utilised a sit-and-reach box with the toe line at 23 centimetres (Heyward, 2000). The test was completed barefoot, with the participant instructed to sit on the floor, knees extended and soles of the feet against the outside edges of the box. Keeping knees fully extended, arms evenly stretched in front and hands parallel with palms down, the woman slowly moved a marker along the top of the box, head down, as far as possible. This hold was maintained for two seconds, with the score corresponding to the distance the marker was moved with both hands. Three trials were completed, and the furthest distance was recorded. This test has been suggested to be a good measure of hamstring flexibility, but limited in assessing lower back flexibility (Jackson & Baker, 1986; ACSM 2006).

**Interventions**

**Counselling protocol.** Women randomised into the counselling-only or exercise and counselling combination group attended a weekly one-on-one counselling session for approximately 45 to 60 minutes for the 5-month duration of the program. Those placed into the exercise-only or usual care group began counselling after their first 8 weeks were over, at which point all groups began both exercise and counselling for the remaining 12 weeks. Session frequency was determined over the course of the study on a needs-based schedule discussed between the counsellor and participant. Sessions were completed on the same day as one of the exercise sessions if the participant was in the combination group. All
sessions were conducted by a Master of Counselling student trained and supervised by an accredited psychologist.

The general aim of the counselling sessions were to form relationships, let the participants have a voice, and learn how to do so outside of the counselling sessions, and aid the women in exploring what they have been through and where to go from there. Though specific issues and events discussed were kept confidential between the counsellor and participant, a few key themes were relevant for most participants. Sessions primarily focused on relationship issues, working on ways of verbalising thoughts and concerns with family and friends and taking back some control in situations. Other topics of discussion were stress management, searching for the positive, dealing with issues of the past, and embracing changes and positive risk-taking.

**Exercise protocol.** Participants in the exercise-only group and exercise and counselling combination group were instructed to attend one to three weekly sessions lasting for approximately one hour, for a five-month period at the rehabilitation centre anytime during open clinic hours on Monday, Wednesday and Friday mornings. All sessions were overseen by an accredited exercise physiologist, and also by qualified personal trainers responsible for providing direct supervision of participants. Each exercise session consisted of flexibility, resistance training and an aerobic component, lasting for at least 20 minutes, as recommended by ACSM for special and elderly populations (2006). Each session began with an aerobic warm-up and workout, utilising a treadmill, seated bicycle, upright bicycle or crosstrainer (Appendix D). Initial cardiorespiratory activity length and intensity was customised for each participant based on the results of their baseline testing, and time was progressed until 20 to 30 minutes of activity could be comfortably achieved. Interval training, utilising changes in speed, resistance or incline, was incorporated as participants progressed in the aerobic component. Resistance and balance training was then undertaken for approximately 20 to 30 minutes, and each session ended with a 5- to 10-minute cool-down utilising a light cardiorespiratory component and whole-body static stretching. For the resistance training component, 8 to 12 different exercises were incorporated into the session, with participants performing 1 to 2 sets
of 8 to 20 repetitions, depending on the exercise and the individual participant’s baseline results and progression. Programs were updated weekly to include more repetitions, sets, weight increase or new exercise as the participant advanced in the program. To perform the various resistance exercises, free weights, weight machines, therabands and own body weight were utilised, depending on the exercise. Undertaken exercises targeted all major muscle groups, with a trainer carefully monitoring performance to ensure correct form and control. Balance tasks were also performed, utilising single-leg standing before progression to single- and double-leg balance tasks on a BOSU ball.

A home-based program was also devised and implemented using an earlier program created by Sandy Hayes and Elizabeth Eakin as a guideline (2006). Participants attended at least one session at the clinic each week, and then completed the remaining sessions at home using a theraband, fitball and available cardiorespiratory equipment. Each participant was shown the home program during her initial exercise session, and was then given ways to advance this program as she progressed. Women were also able to use this program if they went on holiday during their time in the intervention. A weekly home exercise log and home program exercise booklet was given to each participant to ensure correct adherence and provide guidance (Appendix D).

**Usual care control group.** Women enrolled in the usual care group completed the initial physiological and psychological assessment and were then encouraged to maintain their normal daily activities during the eight weeks they were in the usual care group. Additionally, the participants were instructed not to enrol in any structured physical activity or counselling programs for those two months. Each woman was then contacted during week seven of her involvement in the study and scheduled for her mid-program assessment, during which she completed the same physiological and psychological tests done at baseline. The participant was then enrolled in both exercise and counselling for the remaining 12 weeks of the intervention.

**Adherence**
Adherence to exercise was monitored for each participant. The number of counselling sessions was on a needs-based schedule based on both the clinician’s recommendation and the participant’s willingness, so specific attendance figures were not recorded. Instead, adherence was measured as whether or not the participant attended counselling until she was “graduated” by the counsellor. With exercise, attendance was recorded for each session, with home-based sessions monitored by checking the exercise log completed by the participant. Reasons for any missed sessions were tracked as well. Women who went on holiday during program duration were given a home-based program and daily log to minimise missed sessions. Participant dropout and reasoning was also recorded.

**Statistical Analysis**

Statistical analysis was completed using the Statistical Package for the Social Sciences (SPSS) version 17.0 software (SPSS Inc., Chicago, IL). Due to the small sample size, nonparametric testing was utilised for data analysis. Baseline descriptive statistics were compared using the Kruskal Wallis test and asymptotic significance values for continuous variables and Fisher’s Exact test values from Chi-Square crosstabs with two-tailed exact significance results for categorical variables. Between-group analyses comparing $\Delta_{8\text{wk}}$, $\Delta_{12\text{wk}}$, and $\Delta_{20\text{wk}}$ values were completed utilising Kruskal Wallis testing and asymptotic significance values, with no adjustments made for baseline variation. Within-group comparisons were made using Wilcoxon Signed Ranks test from baseline to 8 weeks, 8 weeks to 12 weeks, and baseline to 20 weeks, looking at 2-tailed exact significance values. Spearman Rho correlation was performed to examine the relationship between emotional self-efficacy and both adherence and physiological and psychological changes over the 20 weeks. Median and range were reported for relevant analyses due to the use of nonparametric tests, though mean and standard error values were included as well. Discrepancies between the median and mean values are addressed by presenting information on individual scores that may have impacted the groups’ values. The significance level for all comparisons was set at $p=0.05$. To examine if any groups experienced a clinically significant change in the main variable of interest, emotional self-efficacy, from baseline to the end of the 20-week intervention, Jacob Cohen’s suggestion of using an effect size of 0.50 was utilised (1988).
Results

Participant recruitment and baseline characteristics

Participant recruitment commenced in October 2008 and concluded in May 2009, with women beginning the program on a rolling basis. Figure 3 presents a summary of how women were transitioned through the program. Out of the 23 women who expressed interest in participating, 21 were eligible for the study. The reason for ineligibility was still undergoing treatment (n=2).

Table 6 presents baseline demographic (age, marital status) and medical characteristics (weight, BMI, hypertension, menopausal status, cancer-related statistics) of study participants.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall n=19</th>
<th>Counselling n=5</th>
<th>Exercise n=5</th>
<th>Exercise &amp; Counselling n=5</th>
<th>Usual Care n=4</th>
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<tbody>
<tr>
<td></td>
<td># of patients or M</td>
<td>% or range</td>
<td># of patients or M</td>
<td>% or range</td>
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<td>53-70</td>
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</tr>
</tbody>
</table>

Note: M, median; BMI, body mass index; Lump, lumpectomy; Mast, mastectomy; FEC, fluorouracil, epirubicin, cyclophosphamide; FEC-T, fluorouracil, epirubicin, cyclophosphamide, docetaxel; AC-T, doxorubicin, cyclophosphamide, docetaxel; TC, docetaxel, cyclophosphamide; E-CMF, epirubicin, cyclophosphamide, methotrexate, fluorouracil

* p < .05

The median age was 56 years and ranged from 37-73 years, with 89.5% of the women married and 42.1% post-menopausal. In relation to their cancer, women typically had Stage II cancer (52.6%) and a median of 5 months post-treatment (range=1-24 months), which usually involved a mastectomy (68.4%), chemotherapy
(73.7%), radiation (63.2%), and some form of hormone therapy (94.7%). Groups were balanced on all medical variables, with the exception of whether or not they underwent radiation (p=0.039). The only significant difference in demographic variables found at baseline was in relation to age (p=0.026). Due to the small number of participants in each group and need to use non-parametric tests, no adjustments for the variation in age and radiation treatment were made during analyses. Instead, the potential impact of these differences is explored further in the discussion. Additionally, it is important to point out that clinically significant differences in baseline parameters may have existed between groups. For example, BMI differences of ≥1 kg/m² are typically considered clinically significant, and there was a range of 6.3 units in group BMI values. Relevant implications of such differences are examined in the discussion. Baseline values of the assessed physical and psychological parameters are presented in Table 7.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall n=19</th>
<th>Counselling n=5</th>
<th>Exercise n=5</th>
<th>Exercise &amp; Counselling n=5</th>
<th>Usual Care n=4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESE (SESES-C)</td>
<td>71.33 (76.45)</td>
<td>37.33-96.67</td>
<td>54.67</td>
<td>82.67-97.33</td>
<td>54.67</td>
</tr>
<tr>
<td>Body comp (%BF)</td>
<td>33 (21.16)</td>
<td>25.1-32.9</td>
<td>33.4</td>
<td>24.6-38.6</td>
<td>37.2</td>
</tr>
<tr>
<td>V O₂max (Modified Bruce, mL•kg⁻¹•min⁻¹)</td>
<td>30.22 (1.004)</td>
<td>28.9-34.1 (1.027)</td>
<td>30.91 (29.8)</td>
<td>22.81-36.5 (2.275)</td>
<td>30.9 (30.5)</td>
</tr>
<tr>
<td>UB strength (YMCA BP, repetitions)</td>
<td>16 (19)</td>
<td>0-44 (3.1)</td>
<td>13 (17)</td>
<td>0-36 (6.8)</td>
<td>15 (13)</td>
</tr>
<tr>
<td>LB strength (1RM LP, kg)</td>
<td>70 (70.8)</td>
<td>60 (66)</td>
<td>40-90 (8.718)</td>
<td>60 (72)</td>
<td>50-110 (12.14)</td>
</tr>
<tr>
<td>Flexibility (Sit-and-reach, cm)</td>
<td>2.5 (2.7)</td>
<td>-13-17 (1.917)</td>
<td>2.5 (1)</td>
<td>-13-9.5 (4.053)</td>
<td>1 (0.7)</td>
</tr>
</tbody>
</table>

Note. Med, median; M, mean; SE, standard error; ESE, emotional self-efficacy; SESES-C, Stanford Emotioinal Self-Efficacy Scale-Cancer; %BF, percent body fat; V O₂max, maximal volume of oxygen consumed; UB, upper body; BP, bench press; LB, lower body; LP, leg press; RM, repetition maximum

Important to note from these results is that no significant differences between groups existed at baseline for emotional self-efficacy or any of the physiological variables. There was discrepancy between the median and mean values of C self-efficacy scores (54 versus 63.47), but no one individual baseline score appeared to influence this. The same trend was observed in the UC group (median=90, =106.3), though
this likely resulted from a potential outlier scoring 173.3 and the group only containing 4 rather than 5 participants. Similar discrepancies between median and mean are seen in ExC upper body strength, Ex lower body strength, and ExC and UsC flexibility, primarily existing due to the impact of a potential outlier on the mean. The impact of such discrepancies is mentioned in the limitations section of the discussion. The potential existence of clinically significant differences between groups at baseline is also examined in the discussion.

Adherence
Two subjects pulled out of the study prior to fully completing the eight-week assessment, with both being from the usual care group. One ceased participation due to injury unrelated to the study, and the other subject was no longer able to commute to the program. These two individuals were therefore considered “dropouts” and all related data was excluded from data analysis. This resulted in 19 subjects overall completing all three assessments (baseline, 8-week, and 20-week), with 5 participants each in the exercise-only, counselling-only, and exercise and counselling group and 4 women in the usual care group.

Attendance to supervised exercise sessions was monitored for each participant once she commenced this component of her program, either at the start or after the eight-week assessment, depending on allocated treatment group. Maximum number of sessions each participant could attend varied based on which group she was in and how much of her program was home- versus gym-based. Participants taking holiday during enrolment in the exercise component were given a home-based program to continue while away. Adherence to this program was self-reported and tracked by the participant utilising an individualised exercise log (Appendix). Overall median exercise adherence was 79% (n=19, range=33-100%). Group-specific adherence rates were: exercise-only group (n=5, median=77%, range=70-100%), counselling-only group (n=5, median=79%, range=72-94%), exercise and counselling group (n=5, median=83%, range=50-89%), usual care (n=4, median=76.5%, range=33-90%). Figure 4 presents the given reasons for missed sessions, with the primary causes for absenteeism being sickness (32%), work (19%), and injury sustained outside the program (19%).
Adherence to counselling was not based on number of sessions attended, as these sessions were conducted on a needs-based schedule discussed between the counsellor and participant. Instead, subjects were either classified as “non-compliant” (NC) or “graduated” (G) based on whether they continued long enough to participate in a closing session with the counsellor. The counsellor did not have specific graduation criteria, but based it more on overall progress from initial session and other patient-specific advances that were not disclosed for sake of privacy protection. Due to this method of tracking adherence, no specific data was recorded on number of sessions attended and required for counselling completion. Overall results were 2 classified as NC and 17 deemed G. In relation to group-specific figures, the averages are as follows: exercise-only (NC=1, G=4), counselling-only (NC=0, G=5), exercise and counselling (NC=0, G=5), usual care (NC=1, G=3). The reasons given for non-compliance were belief they did not need counselling (n=1) and unwillingness to schedule time for sessions (n=1). It is not known if these participants held this view prior to program commitment or developed it after enrolment, but follow-up study would be beneficial to examine reasons for these beliefs.

8-Week Differences

**Between-group differences.** The Kruskal-Wallis test was utilised to examine differences between groups for eight-week changes (Δ). Table 8 presents

![Figure 4](image-url). Percentages of sessions missed and corresponding reasons.
Changes in emotional self-efficacy (SESES-C scores) approached significance (p=0.052), with mean rank values indicating the three treatment groups, C, Ex, and ExC, all improved compared to UsC (Figure 5).
Figure 5. Changes from baseline to 8-week assessment in emotional self-efficacy in each group (C, Ex, ExC, and UsC), as assessed by the Stanford Emotional Self-Efficacy Scale-Cancer (SESES-C).

C and ExC had the highest mean delta 8-week values (\(\bar{x}=11.1\)), though ExC had a higher median self-efficacy score improvement than C (17.3 versus 12). This finding is important as it suggests the combination of exercise and counselling produced the greatest improvement in self-efficacy levels. Additionally, those women in UsC that received no initial intervention actually experienced a decline in emotional self-efficacy (median=12). One other finding in relation to self-efficacy scores was the discrepancy between median and mean scores in the ExC and UsC groups (17.3 vs 11.1; -12 vs. -33.3, respectively). In the ExC group, this finding did not appear to be due to an outlier but rather a result of the data range. In the UsC group, a participant scoring -107, much lower than the remaining 3, likely caused the observed difference between median and mode.

For physical changes, a significant difference between groups was observed in upper body strength (p=0.010), as assessed by the YMCA bench press protocol (Figure 6).

![Figure 6](image)

**Figure 6.** Changes from baseline to 8-week assessment in upper-body strength in each group (C, Ex, ExC, and UsC), as assessed by number of repetitions performed of YMCA bench press.

Both Ex and ExC increased in the number of repetitions completed from baseline to eight weeks, with Ex increasing by a median of 9 repetitions and ExC by a median of 4 repetitions. As expected, little change was seen in the UsC group (median=1) and
a decline was observed in C (median=-7). These differences are important because they support the idea that engaging in exercise is important for rebuilding upper body strength, while no structured exercise participation leads to no gain, or even a loss, in strength.

Eight-week differences between groups in relation to change in weight in kg (p=0.071) and BMI in kg/m\(^2\) (p=0.065) also approached significance. Based on median values, the C group had the greatest increase in these two parameters (weight: median=0.15; BMI: median=0.1), while ExC had the greatest decrease (weight: median=-0.6; BMI: median=-0.2). Results of the Kruskal-Wallis test revealed no significant differences between groups for 8-week changes in percent body fat (p=0.213), lower body strength (p=0.419), cardiorespiratory endurance (p=0.139), or flexibility (p=0.146). However, trends suggested Ex and ExC produced improvements in lower body strength, cardiorespiratory endurance, and flexibility, while C and UsC participants remained relatively the same or even decreased, again emphasising the importance of exercise in improving physical well-being (Figures 7-9). One other finding in relation to cardiorespiratory endurance was the difference in C’s median and mean values (0.3 vs. -4.23), likely the result of the spread of the data (three slight improvements and two declines) rather than an outlier.

![Figure 7. Changes from baseline to 8-week assessment in lower-body strength in each group (C, Ex, ExC, and UsC), as assessed by a 1-RM leg press.](image)
Changes from baseline to 8-week assessment in cardiorespiratory endurance in each group (C, Ex, ExC, and UsC), as assessed by VO$_{2max}$ values obtained utilising the Modified Bruce treadmill protocol.

**Within-group differences.** The Wilcoxon Signed Ranks test was used to identify any significant changes within groups from baseline to the eight-week assessment. A marginally significant decrease in emotional self-efficacy was observed in the UsC group, with scores decreasing from 106.3 to 73 over the initial 8 weeks ($\Delta=-33.3; p=0.068$). The Ex group exhibited a significant increase in upper body strength ($p=0.042$), improving from a mean of 13 repetitions at baseline to 21.2 repetitions after 8 weeks ($\Delta=8$). ExC had a significant 8-week increase in
flexibility from 2.7 cm to 6.5 cm ($\bar{x} \Delta= 3.8$ cm; $p=0.042$), and significant decreases in weight and BMI ($p=0.043$), which decreased, respectively, from 84.5 kg to 83.81 kg ($\bar{x} \Delta= -0.72$) and from 30.5 kg/m² to 30.2 kg/m² ($\bar{x} \Delta= -0.26$ kg/m²). In the C group, upper body strength was found to decline over the initial 8 weeks, with YMCA bench press repetitions decreasing from 17 to 12 ($\bar{x} \Delta= -5.4$; $p=0.066$).

### 12-Week Differences

**Between-group differences.** Changes were also compared between groups corresponding to the 12-week period from week 8 to week 20, when all participants partook in exercise and counselling. Results of the Kruskal-Wallis test revealed a significant difference between groups for cardiorespiratory endurance, measured as $\dot{V}O_{2\text{max}}$ in mL·kg⁻¹·min⁻¹ ($p=0.036$) (Figure 10).

![Figure 10](image)

*Figure 10.* Changes from 8-week to 20-week assessment in cardiorespiratory endurance in each group (C, Ex, ExC, and UsC), as assessed by $\dot{V}O_{2\text{max}}$ values (mL·kg⁻¹·min⁻¹) obtained utilising the Modified Bruce treadmill protocol.

Median values revealed C (7.8) and UsC (5.78) achieved greater improvements during the 12-week period than Ex (median=0.8) or ExC (median=2), indicating a catch-up effect. The observed increase in cardiovascular fitness in C and UsC participants suggest the addition of exercise to these groups’ treatment was beneficial for aerobic fitness. No other significant 12-week changes were found between groups in any other physiological variables (Table 9).
Table 9

12-week Psychological and Physiological Changes of Participants Overall and by Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall n=19</th>
<th>Counselling n=5</th>
<th>Exercise n=5</th>
<th>Exercise &amp; Counselling n=5</th>
<th>Usual Care n=4</th>
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<tr>
<td><strong>ESE (SESES-C)</strong></td>
<td>4 (7.483)</td>
<td>9.33 (4.257)</td>
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<td><strong>Weight (kg)</strong></td>
<td>-0.4 (-0.158)</td>
<td>-3.25 (-1.57)</td>
<td>-4.2 (-0.44)</td>
<td>1.8 (0.401)</td>
<td>1.8 (0.735)</td>
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<tr>
<td><strong>BMI (kg/m2)</strong></td>
<td>0.073 (0.132)</td>
<td>-1.35 (-0.62)</td>
<td>-1.0 (-0.134)</td>
<td>0.58 (0.236)</td>
<td>0.15 (0.257)</td>
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<td><strong>Body comp (%BF)</strong></td>
<td>-0.5 (-0.78)</td>
<td>-2.8 (-1.53)</td>
<td>-1.67 (-0.68)</td>
<td>0.5 (0.203)</td>
<td>0.625 (0.322)</td>
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<tr>
<td><strong>V O₂max</strong> (Modified Bruce, mL·kg⁻¹·min⁻¹)</td>
<td>2.9 (3.836)</td>
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<td>-1.68 (-2.752)</td>
<td>0.8 (1.672)</td>
<td>2.9 (2.496)</td>
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<tr>
<td><strong>UB strength (YMCA BP, repetitions)</strong></td>
<td>6 -8.2 (-1.736)</td>
<td>11 (10.6)</td>
<td>3-22 (2.993)</td>
<td>4 (3)</td>
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<td><strong>LB strength (1RM, kg)</strong></td>
<td>0.5 (4.211)</td>
<td>-30 (-12.08)</td>
<td>-10 (-12.08)</td>
<td>0 (0)</td>
<td>15 (7.071)</td>
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<tr>
<td><strong>Flexibility (Sit-and-reach, cm)</strong></td>
<td>1 -4.5 (0.813)</td>
<td>4 (3.6)</td>
<td>0.5-8 (1.355)</td>
<td>1 (1.57)</td>
<td>0.5 (0.017)</td>
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Note: Med, median; M, mean; SE, standard error; ESE, emotional self-efficacy; SESES-C, Stanford Emotional Self-Efficacy Scale-Cancer; %BF, percent body fat; CR, cardiorespiratory; VO₂max, maximum volume of oxygen consumed; UB, upper body; BP, bench press; LB, lower body; LP, leg press; RM, repetition maximum

* p < .05

However, trends indicated that both C and UsC improved in upper-body strength, lower body strength, and flexibility from week 8 to week 20, suggesting a positive impact of the addition of exercise to their program (Figures 11-13).
Figure 11. Changes from 8-week to 20-week assessment in upper-body strength in each group (C, Ex, ExC, and UsC), as assessed by number of repetitions performed of YMCA bench press.

Figure 12. Changes from 8-week to 20-week assessment in lower-body strength in each group (C, Ex, ExC, and UsC), as assessed by a 1-RM leg press.
Additionally, C, ExC, and UsC all increased emotional self-efficacy levels from week 8 to week 20 (Figure 14). Though ExC had some difference between the median and mean self-efficacy scores (4 vs. 16.67), this appeared to result more from the range of the data than an outlier.

**Within-Group Differences.** Wilcoxon Signed Ranks tests revealed a marginally significant difference in exercise adherence during the first 8 weeks compared to the final 12 weeks for both Ex and ExC (p=0.062). Participants in the Ex group went from an average session attendance of 92.6% at 8 weeks to 73.6%
during the second half of the intervention, while ExC rates dropped from 88.2% of sessions to 70.2%. As neither the C or UsC group participated in exercise during the first 8 weeks, this comparison was not relevant.

The C group exhibited significant improvements in weight (p=0.043), BMI (p=0.042), upper body strength (p=0.042), cardiorespiratory endurance (p=0.043), and flexibility (p=0.043). Weight, and as a result BMI, decreased from the 8-week assessment to the conclusion of the program from a mean value, respectively, of 64.63 kg and 23.9 kg/m$^2$ to 63.1 kg and 23.3 kg/m$^2$ ($\bar{X} = -1.57$ kg; $\bar{X}$ = -0.62 kg/m$^2$). Cardiorespiratory endurance, as assessed by $\dot{V}O_{2\text{max}}$ values, improved by 8.12 mL·kg$^{-1}$·min$^{-1}$, increasing from 26.86 to 35 mL·kg$^{-1}$·min$^{-1}$. Additionally, upper body strength testing was found to increase, indicated by YMCA bench press repetitions increasing from 12 to 23 ($\Delta=10.6$), and flexibility went from 1.8 cm at week 8 to 5.4 cm at week 20 ($\Delta=3.6$ cm). These results indicate partaking in exercise for 12 weeks was sufficient to produce physiological improvements. No other significant within-group emotional self-efficacy or physiological changes from the 8-week assessment to the final assessment at 20 weeks were observed in the Ex, ExC, or UsC groups.

### 20-Week Differences

#### Between-Group Differences. Kruskal-Wallis testing revealed no significant differences between groups in delta values over the full 20 weeks of the program for any of the physiological or psychological variables (Table 10).

#### Table 10

20-week Psychological and Physiological Changes of Participants Overall and by Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall n=19</th>
<th>Counselling n=5</th>
<th>Exercise n=5</th>
<th>Exercise &amp; Counselling n=5</th>
<th>Usual Care n=4</th>
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<td>Range (SE)</td>
<td>Med (M)</td>
<td>Range (SE)</td>
<td>Med (M)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td>-3.33-36</td>
<td>2.67</td>
<td>-10</td>
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<tr>
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<td>(6.717)</td>
<td>(18.4)</td>
<td>(8.139)</td>
<td>(3.733)</td>
<td>(-23)</td>
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<td>Weight (kg)</td>
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<td>(0.41)</td>
<td>(0.3)</td>
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<td>BMI (kg/m2)</td>
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<td>0.237</td>
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<td></td>
<td>(-0.114)</td>
<td>(-0.124)</td>
<td>(-0.03)</td>
<td>(0.075)</td>
<td>(-0.03)</td>
</tr>
<tr>
<td>Body comp (%BF)</td>
<td>-0.5</td>
<td>-2.17-1.4</td>
<td>-1.0</td>
<td>-0.02</td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
<td>(-0.78)</td>
<td>(-0.594)</td>
<td>(-0.122)</td>
<td>(0.246)</td>
<td>(-0.225)</td>
</tr>
</tbody>
</table>

p-values are included in parentheses.
Within-Group Differences. Results from the Wilcoxon Signed Ranks test indicated the C and Ex groups had significant within-group changes from baseline to 20 weeks, while UsC experienced marginally significant improvements. In the C group, baseline weight and BMI were both higher than values observed at the conclusion of the intervention (p=0.043), with weight decreasing from 64.6 kg to 63.1 kg (Δ=1.55) and BMI going from 23.9 kg/m\(^2\) to 23.3 kg/m\(^2\) (Δ=-0.594). Additionally, cardiorespiratory endurance significantly increased from 31.09 mL·kg\(^{-1}\)·min\(^{-1}\) to 35 mL·kg\(^{-1}\)·min\(^{-1}\) (Δ=3.892; p=0.043), while bench press repetitions went from 17 to 23 (Δ=5; p=0.068) and flexibility went up from 1 cm to 5.4 cm (Δ=4.4; p=0.042). The Ex group experienced a significant increase in upper-body strength (p=0.043), improving the number of YMCA bench press repetitions from 13 to 24 (Δ=11). Marginally significant physiological improvements were observed in UsC, who improved cardiorespiratory endurance from 28.63 mL·kg\(^{-1}\)·min\(^{-1}\) to 35 mL·kg\(^{-1}\)·min\(^{-1}\) (Δ=6.338; p=0.068), upper-body strength from 18 to 26 repetitions...
(\overline{\Delta}=8.25; p=0.068), and lower-body 1-RM strength from 65 to 80 kg (\overline{\Delta}=15; p=0.063). These positive changes highlight the beneficial impact of exercise. No significant changes were observed in emotional self-efficacy scores, though C, Ex, and ExC all improved in this parameter from baseline to the end of the 20 weeks.

**Emotional Self-Efficacy Correlations**

Spearman’s correlation coefficient was used to examine potential correlations between baseline emotional self-efficacy levels and both overall adherence and 20-week changes in physiological and psychological parameters. Results from the test are presented in Table 11.

<table>
<thead>
<tr>
<th>Variable</th>
<th>r_s</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise adherence</td>
<td>-0.181</td>
<td>0.458</td>
</tr>
<tr>
<td>(\Delta20\text{wk }%BF)</td>
<td>-0.137</td>
<td>0.576</td>
</tr>
<tr>
<td>(\Delta20\text{wk }V_{O_{2}}\text{max})</td>
<td>0.147</td>
<td>0.547</td>
</tr>
<tr>
<td>(\Delta20\text{wk Bench Press})</td>
<td>-0.391</td>
<td>0.098</td>
</tr>
<tr>
<td>(\Delta20\text{wk 1-RM})</td>
<td>0.141</td>
<td>0.565</td>
</tr>
<tr>
<td>(\Delta20\text{wk Flexibility})</td>
<td>-0.573</td>
<td>0.010*</td>
</tr>
<tr>
<td>(\Delta20\text{ wk SESES-C})</td>
<td>-0.881</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

**Note.** wk, week; \%BF, percent body fat; \(V_{O_{2}}\text{max}\), maximum volume of oxygen consumed; RM, repetition maximum; SESES-C, Stanford Emotional Self-Efficacy Scale-Cancer

\* p < .05; \** p < .01

Baseline self-efficacy scores were found to negatively correlate with 20-week changes in both flexibility (\(r= -0.573; p=0.010\)) and emotional self-efficacy scores (\(r= -0.881; p=0.000\)), suggesting participants with lowest baseline self-efficacy improved their flexibility and self-efficacy levels greatest over the 20 weeks, and vice versa, compared to other participants. These findings have important implications, as they suggest participants with the lowest self-efficacy had the most to gain from this program. No other significant correlations were observed between baseline self-efficacy scores and adherence or any of the other physiological
variables of interest. An additional correlation examined was between overall change in emotional self-efficacy levels and exercise program adherence, with no significant relationship observed (r=0.175; p=0.474).

Correlations between emotional self-efficacy levels and weight and BMI were also examined (Table 12), as previous research has suggested weight gain is associated with decreased self-efficacy (Levine, Raczynski, & Carpenter, 1991).

Table 12

<table>
<thead>
<tr>
<th>Correlation</th>
<th>rs</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline ESE and weight</td>
<td>-0.138</td>
<td>0.572</td>
</tr>
<tr>
<td>Baseline ESE and BMI</td>
<td>-0.065</td>
<td>0.792</td>
</tr>
<tr>
<td>Final ESE and weight</td>
<td>-0.097</td>
<td>0.691</td>
</tr>
<tr>
<td>Final ESE and BMI</td>
<td>-0.104</td>
<td>0.670</td>
</tr>
<tr>
<td>Baseline ESE and Δ20wk Weight</td>
<td>0.051</td>
<td>0.836</td>
</tr>
<tr>
<td>Baseline ESE and Δ20wk BMI</td>
<td>0.063</td>
<td>0.797</td>
</tr>
<tr>
<td>Final ESE and Δ20wk Weight</td>
<td>0.466</td>
<td>0.044*</td>
</tr>
<tr>
<td>Final ESE and Δ20wk BMI</td>
<td>0.432</td>
<td>0.065</td>
</tr>
</tbody>
</table>

Abbreviations: ESE, emotional self-efficacy; BMI, body mass index
* p < .05

Unexpectedly, emotional self-efficacy levels at the conclusion of the 20-week program were seen to positively correlate with overall increases in weight (r=0.466; p=0.044) and BMI (r=0.432; p=0.065). This finding indicates that higher final emotional self-efficacy levels were seen in those women who had the greatest increases in weight and BMI. No other significant correlations were observed.

**Adverse Effects**

No participants experienced any adverse effects from partaking in the program. One participant sprained an ankle, another had Achilles problems, and a third had chronic back problems reaggravated during their time in the study, but all incidences occurred outside of the clinic and were unrelated to participation. Additionally, no cases of lymphoedema developed or worsened during exercise participation. Arm circumferences were monitored during the program, and values were recorded as part of the baseline, 8-week, and 20-week assessment. The only significant difference observed was in the right forearm of the C group (p=0.042) and indicated a positive impact of exercise, as circumference was observed to decrease from baseline to the end of the program (median=-0.5 cm). Median values indicated all groups either maintained or decreased their forearm and upper arm circumferences over the 20
weeks of the study, with no other significant changes from baseline to 20 weeks observed (Table 13).

Table 13

<table>
<thead>
<tr>
<th>Group</th>
<th>Right Forearm M (Range)</th>
<th>P</th>
<th>Left Forearm M (Range)</th>
<th>p</th>
<th>Right Upper Arm M (Range)</th>
<th>p</th>
<th>Left Upper Arm M (Range)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.5 (-0.5-1.5)</td>
<td>0.042*</td>
<td>-0.3 (-1.5-0.5)</td>
<td>0.498</td>
<td>-1 (-5-2)</td>
<td>0.416</td>
<td>-0.5 (-4-3)</td>
<td>0.892</td>
</tr>
<tr>
<td>Ex</td>
<td>0 (-0.8-1.5)</td>
<td>0.465</td>
<td>0 (-1.2-1)</td>
<td>0.715</td>
<td>0 (-2.3-2)</td>
<td>1.000</td>
<td>-1.2 (-2-1)</td>
<td>0.144</td>
</tr>
<tr>
<td>ExC</td>
<td>-1 (-2-0)</td>
<td>0.068</td>
<td>-0.5 (-1-0)</td>
<td>0.102</td>
<td>0 (-2-0.5)</td>
<td>0.414</td>
<td>0 (-1.5-1.9)</td>
<td>0.581</td>
</tr>
<tr>
<td>UsC</td>
<td>-0.75 (-1-0.5)</td>
<td>0.194</td>
<td>-0.75 (-1.5-0.5)</td>
<td>0.197</td>
<td>-0.5 (-4-1.5)</td>
<td>0.593</td>
<td>-0.75 (-4-1.5)</td>
<td>0.465</td>
</tr>
</tbody>
</table>

Note. M, median; C, counselling-only; Ex, exercise-only; ExC, exercise and counselling; UsC, usual care
* p < .05

CHAPTER 5

Discussion

Overview
The aim of this study was to determine if a combined exercise and counselling program could improve emotional self-efficacy and physical well-being, and if a link existed between program adherence and resulting improvements. Overall, the results of this study suggested exercise and counselling were capable of producing psychological and physiological benefits. Exercise appeared to impact physiological domains, as expected, while both exercise and counselling resulted in improvements in emotional self-efficacy, though the combination of the two modalities appeared most beneficial. Additionally, these improvements were attainable without producing adverse effects such as lymphoedema.

In relation to emotional self-efficacy, overall results suggested a combination of exercise and counselling most beneficial for producing improvements in this parameter, supporting the study’s first hypothesis. C, Ex, and ExC all improved emotional self-efficacy over the first 8 weeks and full 20 weeks of the study, while
UsC actually declined until enrolled in the 12 weeks of exercise and counselling, though remained with an overall score decrease by the end of the program. Differences were not significant, as hypothesised, but this overall decline in UsC and a decline in the Ex group’s scores from week 12 to week 20 were unexpected.

Findings from this study generally supported the hypothesis that partaking in exercise would lead to physiological improvements in the Ex and ExC groups compared to C and UsC over the first eight weeks. Though most changes did not reach significance, group differences were typically a result of C and UsC declining in physical well-being and Ex and ExC improving. In disagreement to this hypothesis was the observation that a catch-up effect occurred and all groups were balanced in physical parameters at the conclusion of the study, regardless if exercising for only 12 weeks (C and UsC) or the full 20 weeks (Ex and ExC).

Contrary to what was hypothesised, no significant correlations were observed between adherence and resulting psychosocial or physiological improvements. Also unexpected was the finding that lower baseline emotional self-efficacy levels were found to correlate with greater overall physiological and psychological improvements in select parameters. Additionally, contrary to expectations was the finding that higher final emotional self-efficacy levels were associated with greater increases in weight and BMI over the 20-week program.

**Adherence**

Adherence is essential for a program to be successful, and care should be taken to monitor attendance rates and track reasons for missing seasons. Doing so may allow for better insight into why participants may not embrace a program or upkeep it. In the breast cancer population, it is essential to find ways to keep participants engaged in physical activity, as long-term maintenance has important implications for survivorship (Holmes et al, 2005). The four treatment groups in this study showed varying rates of exercise adherence, with an overall average attendance rate of 75.1%. Ex participants averaged 81.8% of sessions, C attended 80.4%, ExC attended 77.4%, and UsC participants came to 69% of sessions, with no significant difference in attendance (p=0.872).
Though no other similar programs involving both exercise and counselling were available for direct comparison, adherence to exercise in this study fell within the range of rates observed in other exercise-only studies conducted with a post-treatment population. Milne et al. reported exercise adherence rates in a 24-week study utilising an immediate exercise group (IEG) and delayed exercise group (DEG), only measuring adherence during the 12 weeks of the study when each group was involved in supervised exercise (2008). Overall adherence was 61.3%, with the IEG attending 60.4% of sessions and the DEG participants averaging 62.2%. A 15-week aerobic intervention by Courneya and colleagues involved 53 postmenopausal women assigned to either an exercise group or a control group (2003). Overall exercise adherence was found to be 98.4% of supervised cycle ergometer sessions attended. A home-based walking program conducted by Matthews et al. found self-reported adherence rates of 94% when enrolling 23 women in a 12-week intervention (2007). However, none of the studies discussed reasons for the observed adherence rates or examined potential correlates with adherence, as the current study did.

Only one study could be found that examined potential predictors of adherence, a 12-week home-based aerobic exercise study that based adherence on percentage of participants meeting weekly exercise goals (Pinto, Rabin, & Dunsiger, 2009). Average rates over the 12 weeks were 69.76% achieving weekly goals, with highest adherence in week 2 (90.7%) and lowest adherence in weeks 7 and 9 (53.9%). This drop in adherence is similar to what was observed in the Ex and ExC groups in this study when comparing attendance in weeks 1-8 to that in weeks 8-12. Ex was found to decrease from 92.6% of sessions attended to 73.6%, while ExC went from 88.2% to 70.2%. Pinto and colleagues suggested their observed decline may have resulted from exercise goals being easy to meet in the first weeks and therefore resulting in higher adherence, or, additionally, from the intervention novelty wearing off after the initial weeks (2009).

It is possible that the adherence drop observed in the current study in the Ex and ExC groups may have resulted from the intervention novelty wearing off after the first eight weeks. Additionally, many of the women began returning to or increasing
hours at work as the program progressed, along with 2 of the 10 women in the Ex and ExC groups sustaining outside injuries during the latter half of the intervention that impacted their ability to exercise. Minimal changes in weight from baseline to eight weeks may have also resulted in decreased adherence, as participants may have felt they were not achieving the results they wanted (Ex: $\Delta = 0.74$ kg; ExC: $\Delta = -0.72$ kg). Despite other physiological parameters improving during this time, such as cardiorespiratory endurance and upper body strength, problems with weight and body image have been identified as one of the greatest concerns in post-treatment women (Ganz et al., 1996). However, each woman was encouraged to make one of their program goals to maintain, rather than reduce, weight. This was done because 18 of the 19 participants were still undergoing hormone therapy, a treatment that has been linked to weight gain (Garreau et al., 2006). To achieve noticeable decreases in weight, participants were informed that a lifestyle change relating to areas like diet would need to accompany exercise, but that was not something monitored by this study. More participant feedback is necessary to better understand the impact of these physical issues on the observed decline in adherence.

As C and UsC participants were only enrolled in exercise from the 8-week assessment to the final 20-week assessment, there was only one adherence period for these groups. C attended 80.4% of sessions, and UsC only adhered to 69%, though the rate in UsC was primarily brought down by one patient with attendance of 33%. This low rate was a result of travel issues impacting ability to attend gym sessions, and a chronic back injury making her hesitant to engage in home-based exercise. Without this result, average UsC adherence was 81%, which was similar to the other groups’ averages. However, both C and UsC exhibited lower adherence during their initial exercise period than Ex or ExC. Ex participants had an adherence of 92.6% during the first 8 weeks they exercised, while ExC averaged 88.2% of sessions. As the C and UsC groups had 12 weeks, rather than 8 weeks, corresponding to their initial adherence rate, it may be that novelty wore off and negatively impacted attendance. This is supported by Pinto and colleagues finding lowest adherence rates in weeks seven and nine. Since the exercise component for these two groups was introduced in the second phase of the intervention, some participants had started transitioning back to more regular work hours. Additionally, groups only had to
commit to one day (C group) or no days (UsC) for the first eight weeks, possibly making it difficult to then fit three exercise sessions and one counselling session into their weekly schedule. Finally, in relation to all groups, adherence may have been negatively impacted by the structure of the gym sessions. Participants did not have a designated attendance time, but rather were able to attend any time before 11 on Monday, Wednesday, and Friday mornings. Each woman was assigned a trainer for at least the first eight weeks of her program, which may have helped motivate initial attendance, but was then transitioned to a majority of self-directed workouts to promote autonomy and confidence. This transition, while allowing for potential better long-term exercise maintenance, may explain some of the drop in adherence observed over the course of the program.

One other important component of the current research was examining the potential link between baseline emotional self-efficacy levels and adherence. It is essential to identify factors that may promote greater adherence, as better maintenance of exercise may have important clinical implications for enhancing survivorship (Holmes et al., 2005). Contrary to what was hypothesised, no significant correlation was observed between these parameters. No other studies are available for direct comparison, as other exercise interventions that have examined predictors of adherence have measured exercise self-efficacy rather than emotional self-efficacy (Karvinen et al., 2007; Pinto et al., 2009). Exercise self-efficacy relies on confidence in physical abilities, whereas emotional self-efficacy is related to areas like coping and social interactions.

It may be that the improvements in emotional self-efficacy observed in the current study were more related to embracing the counselling component, rather than to exercise adherence. Interestingly, of the two participants that chose not to partake in counselling, one (UsC) had an exercise adherence of 33% and overall decrease in self-efficacy score of -87.33, while another (Ex) dropped to from 100% to 55% adherence from week 8 to week 20 and also decreased emotional self-efficacy by 5.33 during this time. Though no overall correlation was observed between 20-week emotional self-efficacy changes and exercise adherence, of interest was the finding that the four women in Ex who unexpectedly decreased in emotional self-efficacy
levels during the second phase of the intervention, when their counselling component was introduced, were also the ones with the greatest reduction in adherence. It would be worthwhile to further explore the relationship between counselling, emotional self-efficacy, and exercise adherence in future studies. Additionally, it may be important to note those participants decreasing in emotional self-efficacy, as they may be at a greatest risk for corresponding declines in physical activity.

There are a few potential reasons why no correlation was observed between emotional self-efficacy and exercise adherence. With only 19 participants, it may be difficult to observe significant correlations due to the greater impact outliers may have. Additionally, adherence rates for the Ex and ExC group were related to a 20-week period, whereas those for the C and UsC participants were from the 12 weeks they exercised. The use of baseline self-efficacy scores may also have impacted ability to observe significant correlations, as these values were those obtained from the initial assessment. Adherence for Ex and ExC was recorded beginning immediately after this assessment, while C and UsC did not begin exercise, and as a result adherence calculation, until eight weeks later. However, classifying “baseline” for these two groups as the eight-week assessment self-efficacy score would have been impacted by the treatment they received from weeks zero to eight (counselling or usual care).

Though not included in data analysis, it is worthwhile to highlight that baseline emotional self-efficacy levels of the two participants who dropped out of the study were lower than those of all but one of the women who remained in the program. Their scores were 19.33 and 21.33, compared to an overall study mean of 76.45, suggesting that it may be important to determine baseline self-efficacy scores to identify those participants most likely to not adhere. The one study participant who scored equally low, at 20.67, was randomised to the ExC group, whereas the two drop-outs were in UsC, so it is possible the immediate introduction of the program, rather than 8 weeks of no intervention, may have contributed to her remaining in the study. It would be beneficial to stratify groups on baseline self-efficacy scores to provide support for this potential explanation.
**Emotional Self-Efficacy**

Emotional self-efficacy is an important psychosocial concept in relation to a woman’s recovery from breast cancer. It may influence areas such as coping methods, mood and perceived quality of life, and physical activity levels (Cunningham, Lockwood, & Cunningham, 1991; Valois et al., 2008). A positive finding from this study was that C, Ex, and ExC all improved emotional self-efficacy levels compared to UsC during the first eight weeks of the study, when participants were still in their separate group programs. Additionally, analysis revealed this improvement was greatest in the group receiving both exercise and counselling. During the second phase of the intervention, when all participants were enrolled in exercise and counselling, C, ExC, and UsC improved in emotional self-efficacy levels as predicted. Unexpectedly, Ex participants actually experienced a mean decrease in scores, with four of the five women declining in emotional self-efficacy from week 8 to week 20.

No known studies are available for direct comparison of the impact of a combination exercise and counselling program on emotional self-efficacy. Previous research has only utilised the two modalities in isolation to examine the impact on emotional self-efficacy. Giese-Davis and colleagues found metastatic breast cancer patients enrolled in supportive-expressive group therapy were able to maintain emotional self-efficacy levels over a year, while the control group declined (2002). In a supportive-expressive group therapy program with primary breast cancer women, no significant differences between the therapy and the control group were observed after 12 weeks (Classen et al., 2007). However, the findings of these studies should be related to the current study with caution, as group therapy does not recognise and address each woman’s individual situation and needs as well as one-on-one counselling may. Giese-Davis et al. are the only known research utilising this type of counselling and examine the impact on emotional self-efficacy, though their study involved women still in treatment and peer, rather than professional, counsellors (2006). No significant changes in emotional self-efficacy levels were observed in either the patients or their post-treatment peer counsellors, but it was noted that emotional expression and active coping were common session topics.
No known exercise program studies have examined the impact of such interventions on emotional self-efficacy. However, research has shown exercise is beneficial for producing changes in other psychosocial parameters. Post-treatment women decreased affective and cognitive/mood fatigue in two different studies after a six-month aerobic and resistance training program (Hsieh et al., 2008; Schneider et al., 2007). Another study with post-treatment survivors found 12 weeks of exercise resulted in increased quality of life, self-determined regulation for exercise, and psychological needs satisfaction, as well as decreased social physique anxiety (Milne et al., 2008). While parameters such as these may be related to emotional self-efficacy (Classen et al., 2001), these findings do not allow comparisons with the current study.

With no other studies available for direct comparison, it is not possible to say whether the resulting changes in emotional self-efficacy were typical. Based on what seems to constitute emotional self-efficacy and the expected benefits of counselling and exercise in isolation, the observed changes in this study from baseline to week eight were as hypothesised. Exercise was expected to benefit self-efficacy, as it has been shown to positively impact mood and perceived social support (Mutrie et al., 2007; Rovniak et al., 2002), and this expectation was supported by a median 8-week score increase of 6 in the Ex group. Counselling was also shown to improve emotional self-efficacy as hypothesised (median=12), based on the expectation that counselling allows healthy emotional expression and provides a form of social support (Han et al., 2005). When exercise and counselling were administered together, scores over the first eight weeks were found to increase as well (median=17.3), which was expected since this group received the benefits from both modalities. Additionally, all groups improved emotional self-efficacy more than UsC, who actually decreased in scores, supporting the first research hypothesis. Once all groups enrolled in exercise and counselling during the final 12 weeks of the study, emotional self-efficacy was found to increase in C, ExC, and UsC as hypothesised. Unlike what has hypothesised, however, was the finding that Ex participants actually experienced a mean decrease in scores. This decrease was not enough to result in significant differences between groups in emotional self-efficacy levels at the end of the 20 weeks though, which was hypothesised. A few factors
may have resulted in this unexpected decline in the Ex group. The four out of five group members who declined in self-efficacy scores were also the ones who had the largest drops in adherence in the group after the eight-week assessment. This may have resulted in a decrease in the benefits of exercise on self-efficacy, leading to a score decrease. Also, the introduction of counselling may have made the women more aware of their emotional issues and consequently resulted in more honest answering of the self-efficacy questionnaire. A later assessment, after longer enrolment in the counselling component, is needed to support this possibility.

Finally, reports from the program counsellor revealed that the members of this group were most likely to cancel sessions or not initially embrace the counselling, with one participant deciding not to partake in counselling after her initial session.

In looking at emotional self-efficacy, it is important to note the difference in group median scores at baseline. Though not statistically significant, the 36-unit difference in group scores may have clinical importance. However, as the Stanford Emotional Self-Efficacy Scale is a relatively new tool for assessing self-efficacy, no information could be found on what is considered a minimally important difference for this scale.

To examine if any groups experienced a clinically significant change from baseline to the end of the 20-week intervention, Jacob Cohen’s suggestion of using an effect size of 0.50 was utilised (1988). ExC exhibited the most substantial change over 20 weeks, with an effect size of 0.87, followed by C at 0.83. Neither Ex (0.026) or UsC (-0.054) were found to experience clinically significant improvements over the course of the intervention. This finding supports the earlier results suggesting a combination of exercise and counselling is most beneficial for increasing emotional self-efficacy, though initially beginning participants in counselling prior to exercise may be almost as effective. Additionally, these similar improvements between C and ExC are strengthened by the fact that their baseline median self-efficacy scores were very similar (C=54, ExC=54.67).

Emotional self-efficacy was also examined in relation to overall physiological parameters, as research has suggested there may be a link between self-efficacy and physical functioning and activity levels (Morris and Ingham, 1988; Mosher et al., 2008; Rogers et al., 2005; Valois et al., 2008). Though it was hypothesised that
higher baseline self-efficacy would correlate with greater overall improvements, findings did not support this expectation. Lower baseline levels were actually seen to correlate with greater 20-week improvements in both flexibility and emotional self-efficacy, the reverse of what was expected. It may be that participants with lower self-efficacy at the start had the most to gain from the intervention, resulting in the observed correlations. This potential reason is clinically relevant in that identifying patients with low emotional self-efficacy may be a way of identifying those who may benefit most by an intervention like the current study.

One final relationship examined was between emotional self-efficacy and increases in weight and BMI, as studies have suggested part of the weight gain commonly seen in breast cancer survivors may be associated with psychological variables (Kumar et al., 1997). Levine and colleagues even found that weight gain appeared linked to a decrease in emotional self-efficacy (1991). The only correlations resulting from the current research were between final emotional self-efficacy levels and overall 20-week changes in weight ($r=0.466; p=0.044$) and BMI ($r=0.432; p=0.065$), though the relationships were opposite to what was expected. Greater overall weight and BMI increase were actually seen to correspond with higher final self-efficacy levels. One possible explanation may be that counselling aided women in becoming more comfortable with themselves, helping them learn not to let issues like weight have such an impact on psychological well-being. Additionally, average weight change in this study was actually a decrease of 0.264 kg, with the highest gain only 2.7 kg over 20 weeks. In the Levine et al. study, average weight increase was 6.07 kg, though this was over a 2-year period (1991). As this study was strictly observational, with no exercise or counselling program implemented to try and induce weight or self-efficacy changes, it is hard to accurately relate the findings to the current research.

Also observed in the current study was that an overall mean decrease in percent body fat ($\bar{\Delta}=-0.49$) was seen from baseline to the end of the 20 weeks. Many of the women that were observed to experience a slight weight gain also decreased their body fat, so it may be possible that increased weight resulted more from the addition of muscle than fat. A body composition method like DEXA would need to be utilised to confirm whether decreased body fat was accompanied by a gain in lean
body mass and provide support for the above claim. It would be worthwhile to
examine if a longer-term exercise and counselling intervention revealed similar
correlations between emotional self-efficacy and weight as those seen in this
program, due to the clinical implications. Since exercise programs are often unable
to significantly reverse the weight gain seen in correspondence with breast cancer
treatment (Kirshbaum, 2006; Markes, Brockow, & Resch, 2006; McNeely et al.,
2006), it becomes important for body image and self-esteem to target other
parameters that may be more responsive to interventions. As an overall average
increase was observed in this study in emotional self-efficacy scores, it may be
beneficial to consider self-efficacy as one potential parameter to focus on.

**Physiological Improvements**

**Body composition.** Body weight and composition, often negatively
impacted by cancer treatment, is an important component of overall health. The
weight gain and shift in body composition to more fat mass at the loss of lean body
mass may damage a woman both physically and psychologically. A positive finding
from this study was the reduction in body fat in all groups once enrolled in exercise.
Additionally, no significant increases in weight or BMI were observed once a group
began exercise, with 11 of the 19 participants actually losing weight by the end of the
20 weeks. These findings have favourable clinical ramifications for the women in
this study, as weight gain in this population has been linked to a decrease in quality
of life and increased risk of developing other disorders such as diabetes and
hypertension (Demark-Wahnefried et al, 2002). Research has also suggested that
weight gain may be associated with higher recurrence and mortality rates (Kroenke
et al, 2005).

Though declines in percent body fat did not reach significance in this study either
between or within groups, it is encouraging that as little as eight weeks appeared
capable of producing positive body composition changes. During the first eight
weeks, both Ex and ExC participants experienced a mean decrease in body fat
($\bar{x}$ = -0.35% and -0.56%, respectively), though the median body fat change for Ex
was positive (0.4%; ExC= -0.5%). However, both non-exercising groups increased
in mean and median percent body fat (C: $\bar{x}$=1.22%, median=1%; UsC: $\bar{x}$=0.83%,

69
median=0.81%). The few participants in either Ex or ExC that experienced an increase in body fat during the first eight weeks were actually able to bring about a decline during the second phase of the intervention.

Once C and UsC subjects began exercising, Δ values from 8 weeks to 20 weeks reveal a mean and median decrease in both groups’ body fat (\(\overline{\Delta} = -1.534\%\) and -0.811\%, respectively; median= -1.671\% and -0.995\%). Additionally, only one of these nine participants increased body fat (Δ=0.738\%), which may be in part to an exercise adherence level of only 64\% (compared to \(\bar{\Delta}=77.15\%\)). She was also the youngest participant (age 37), which may have contributed to the observation of an increase in subcutaneous adipose tissue, as research has shown older women tend to increase in visceral rather than subcutaneous tissue more than younger women (Zamboni et al., 1997). As skinfold measurements reflect subcutaneous adipose tissue, it is possible that utilising a method to measure visceral adipose tissue, such as a CT scan, would have yielded different results in the older participants. A longer enrolment of all groups in exercise would likely have yielded a greater decline in percent body fat, as body composition changes occur over longer time periods, and this would have increased the likelihood of observing significant results.

Little variation was observed in weight and BMI for any group, with only C exhibiting marginally significant declines from baseline to study completion (p=0.062). No significant change in these parameters was expected, as 18 of the 19 women were still undergoing hormone therapy, which has been commonly associated with weight gain (Garreau et al., 2006). The short-term aim set for the participants in this study, therefore, was to maintain rather than reduce weight, which this program achieved (\(\overline{\Delta}20wks= -0.264\ kg\)). A longer intervention, or one with fewer participants receiving hormone therapy, would likely have revealed more significant reductions in these parameters.

The observed mean decrease in weight (\(\bar{x} = -0.153\ kg\)) and body fat (\(\bar{x} = -1.005\%\)) occurring with exercise participation supported the trend observed in other studies combining aerobic and resistance training, suggesting exercise may be an effective
way to combat this harmful weight gain. Battaglini and colleagues utilised a six-month individualised exercise intervention incorporating aerobic and strength training, finding significant differences between the control group and the exercise group’s percent body fat at the conclusion of the program (31.2 versus 25.9%, p=0.004) (2007). Another six-month exercise intervention by Demark-Wahnefried et al. found participants significantly decreased body fat compared to historical controls (p=0.002) and lost more body mass (p=0.02) and fat mass (p=0.04) (2002).

A positive shift in body composition has also been linked to improved quality of life and better psychosocial functioning in the form of higher self-esteem and lower depression levels (Courneya et al., 2007b). Though no significant correlations were observed in the current study between percent body fat lost and emotional self-efficacy improvement, both parameters were seen to change for the better over the 20-week intervention. It is possible that larger subject numbers may have revealed a relationship between the two parameters.

One additional issue was the finding that differences between group baseline BMI values, while not statistically significant, were of clinical importance. There was a 5.6 unit range in values, and a 1-unit difference is usually deemed clinically significant. These BMI differences may have impacted a variety of parameters in the study apart from the ability to observe differences between groups following the intervention. Karvinen and colleagues found female cancer survivors with higher BMIs were less likely to adhere to exercise and exhibited lower self-efficacy (2007). In relation to the current study, C had the lowest median baseline BMI (24.1 kg/m²) and 2nd-highest adherence (80.4%), while ExC had the highest baseline BMI (31.4 kg/m²) and 2nd-lowest adherence (77.4%). Though these findings did not completely agree with the findings of Karvinen et al., it would be worthwhile to examine this relationship in a larger study with BMI balanced at baseline. The same is relevant in relation to self-efficacy scores, as C and ExC exhibited the lowest baseline values (C=54, ExC=54.67) despite the significant difference between the groups’ BMI values.
Cardiorespiratory endurance. Adequate cardiorespiratory endurance is a necessity for daily functioning and overall quality of life, aiding individuals in carrying out activities of daily living. The fatigue and decreased physical activity levels commonly observed during and following breast cancer are likely to negatively impact endurance levels, which in turn heightens fatigue and decreases physical activity even more. The resulting increase in cardiorespiratory function ($V\text{O}_{2\text{max}}$) observed in this study is clinically significant, as it may help combat this detrimental feedback loop. Maintaining aerobic fitness has important implications for disease risk, and has also been linked to improved quality of life and lower fatigue and depression in breast cancer patients (Courneya et al., 2007a). Study findings of increased cardiorespiratory endurance following an exercise intervention are consistent with the findings of recent meta-analyses, despite various measures being used to assess this variable (Kim, Kang, and Park, 2009; Markes, Brockow, and Resch, 2007; McKneely et al, 2006).

Devising a program that can preserve or increase aerobic fitness offers both short- and long-term benefits for the participant. In a study by Segal et al., patients in a supervised walking program were found to significantly improve their predicted $V\text{O}_{2\text{max}}$ values as compared to a usual care control, but only if they were not undergoing chemotherapy (2001). These findings were similar to the current study, as groups undergoing exercise improved aerobic fitness while those not partaking in an exercise program experienced either no change (UsC) or a decrease (C) in fitness. Another study by Courneya et al. examining breast cancer patients currently undergoing chemotherapy found significant fitness improvements in the aerobic exercise group when compared to a resistance exercise and a usual care group (2007b). No mention was made of increasing exercise intensity over the duration of Segal’s study (2001), whereas Courneya and colleagues progressively increased both intensity and duration over the course of the intervention, possibly resulting in the observance of significant changes (2007b). Additionally, the resistance training exercise group in Courneya’s study did not experience significant cardiorespiratory fitness increases, suggesting the importance of including an aerobic component in exercise interventions (2007).
Though no significant differences were observed between or within groups at eight weeks, after half the participants had been enrolled in exercise (Ex and ExC groups), C decreased mean $\dot{V}O_{2\text{max}}$ (\(\bar{X} \Delta = -4.23 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}\)), while Ex, ExC, and UsC improved endurance (\(\bar{X} \Delta = 4.84, 1.06, \text{and } 0.5 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}\), respectively). Caution must be taken in interpreting these results, however, due to the small subject number per group. The decline observed in C was primarily from one participant decreasing fitness by 8.08 mL·kg\(^{-1}\)·min\(^{-1}\) and another by 14.8 mL·kg\(^{-1}\)·min\(^{-1}\), reflected by a group median change of 0.3 mL·kg\(^{-1}\)·min\(^{-1}\). This second subject was older than most other participants (age 70, \(\bar{X} = 52 \text{ years}\)), potentially contributing to this substantial drop in aerobic fitness. It is unknown why the other C participant experienced such a notable decline. In regards to UsC, the unexpected mean increase in cardiorespiratory endurance was primarily influenced by one subject improving by 5.33 mL·kg\(^{-1}\)·min\(^{-1}\), supported by the observation that the group median change was -0.15 mL·kg\(^{-1}\)·min\(^{-1}\). The improving participant reported that she began walking more frequently during the eight weeks of usual care, which likely explains this increase. Her data were still included in analysis because she did not join a structured exercise program, which was the only exclusion criteria related to incidences like this. UsC and C participants were asked to maintain normal activities during the first eight weeks, but they could not be forced to refrain from something like walking.

Group differences were observed in $\dot{V}O_{2\text{max}}$ values from week 8 to week 20 (\(p=0.036\)), once all participants engaged in exercise. C, ExC, and UsC all improved mean aerobic fitness in this second phase of the intervention, while Ex actually declined by 1.06 mL·kg\(^{-1}\)·min\(^{-1}\). Though this decrease coincided with decreased exercise adherence compared to the first 8 weeks (72.6% versus 92.6%), the same trend was seen in ExC (70.2% compared to 88.2%) without a corresponding aerobic fitness decrease. This finding in the ExC group is likely due to one participant improving by 13.26 mL·kg\(^{-1}\)·min\(^{-1}\) over the 12 weeks, and also exhibiting the highest adherence during this time (84%). Such findings suggest the importance of emphasising physical activity maintenance and examining ways to continue...
adherence. Also, the median change in aerobic fitness for the Ex group was 0.8 mL·kg\(^{-1}\)·min\(^{-1}\), making follow-up study with larger subject numbers essential.

As hypothesised, both C and UsC improved aerobic fitness once commencing exercise (\(\bar{x}_\Delta=8.12\) and 5.84 mL·kg\(^{-1}\)·min\(^{-1}\), respectively; median=7.8 and 5.78). This observed mean increase in the C group partly resulted from one participant improving by 17.6 mL·kg\(^{-1}\)·min\(^{-1}\), the same one that had such a substantial drop during the first eight weeks. Though age may have factored into this observed increase, it is more likely due to her low level of fitness at the start of exercise (14.9 mL·kg\(^{-1}\)·min\(^{-1}\), compared to \(\bar{x}=29.1\) mL·kg\(^{-1}\)·min\(^{-1}\)), leaving significant room for improvement compared to those with relatively good baseline fitness. This explanation is supported by the other participant of a similar age (72 years) only improving by 5.36 mL·kg\(^{-1}\)·min\(^{-1}\), but having a much higher initial fitness level (23 mL·kg\(^{-1}\)·min\(^{-1}\)).

Though no significant correlations were observed in this study between cardiorespiratory endurance and emotional self-efficacy, other programs have found links between aerobic fitness and psychosocial parameters. Schneider and colleagues found a 6-month combination aerobic and resistance training program capable of significantly improving cardiorespiratory endurance (p<0.05) in breast cancer women both in and completed with treatment (2007). Both groups also experienced reductions in behavioural, sensory, and total fatigue (p<0.05), but only post-treatment participants increased psychological-based fatigue domains as well (affective and cognitive/mood, p<0.05). Hseih et al. found the same physical and psychological changes in a similar study involving only post-treatment women (2008). Improved aerobic fitness has also been observed in conjunction with increased positive mood (Mutrie et al., 2007), as well as decreased social physique anxiety and improved self-determined regulation (intrinsic motivation) for exercise (Milne et al., 2008), following 12 weeks of exercise. As the current study also involved participants in at least 12 weeks of exercise, and this time duration appears sufficient to induce both physical and psychosocial changes, it is possible larger subject numbers would have resulted in significant correlations between improvements in cardiorespiratory endurance and emotional self-efficacy. This is
supported by the finding that both parameters were found to improve from the beginning to the conclusion of exercise ($\dot{V}O_{2\text{max}}$: $\overline{x}\Delta=5.31 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$; emotional self-efficacy $\overline{x}\Delta=184.25$). Additionally, the ability to observe a correlation with this size of a sample may have been impacted by potential outliers, such as one participant with a baseline self-efficacy of 37.33 and 20-week change in $\dot{V}O_{2\text{max}}$ of 8.6 mL\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ and another woman with an emotional self-efficacy score of 71.33 and no overall change in $\dot{V}O_{2\text{max}}$.

**Muscular strength.** Muscular strength is important for overall quality of life. Declined upper-body strength can impact simple daily tasks like carrying the shopping or pushing oneself up, while loss of leg strength can decrease mobility and, as a result, aerobic fitness. The overall increases in both upper-body ($\overline{x}\Delta=10.31$ repetitions) and lower-body strength ($\overline{x}\Delta=9.5\text{kg}$) observed in this study following exercise participation have favourable clinical ramifications, as strength maintenance or increase has been linked to improved quality of life and physical functioning (Courneya et al., 2007a), along with increased confidence as indicated by declining social physique anxiety scores (Milne et al., 2008). A recent study by Milne et al., combining aerobic and resistance training, found significant gains in strength from baseline to final assessment in both the immediate exercise and the delayed exercise groups (2008). Exercises used to assess these strength changes included a bicep curl, leg press and chest extension, measuring the intervention impact on both upper- and lower-body. Battaglini and colleagues found similar strength improvements in an exercise group compared to a control group using a comparable assessment method, a 1-RM protocol, involving leg extension, leg curl, lat pulldown, and chest press (2007). Another study also found significant increases in both upper- and lower-body strength, but only in the resistance training group, rather than the aerobic training or usual care group (Courneya et al., 2007b). In their meta-analysis, Markes, Brockow, and Resch found no significant changes in strength based on the two studies that measured this (2006). Neither study, however, incorporated weight training: one was aerobic-only, and another only utilised tubing as a way of providing resistance training (Crowley, 2003; Drouin, 2002). These findings highlight the importance of incorporating resistance training into an exercise
intervention aimed at producing positive increases in muscular strength and endurance.

A significant difference between groups was observed in relation to delta values from baseline to eight weeks for upper-body strength, as assessed by the YMCA bench press protocol. Both Ex and ExC increased mean and median number of repetitions after eight weeks of exercise ($\overline{x}_8 = 8$ and $5$, respectively; median=9 and 4), while C decreased in mean and median strength ($\overline{x}_C = -5.4$, median= -7). UsC exhibited a median increase of 1 but a mean of -1, due to one participant declining by 8 repetitions while the others increased by only 1 or 2 repetitions. Once C and UsC participants enrolled in exercise following their eight-week assessment, they were able to increase strength beyond initial baseline levels, with both C and UsC improving by a median of 11 repetitions (C: $\overline{x}_C=10.6$; UsC: $\overline{x}_S=9.25$). Both Ex and ExC improved upper-body strength in phase one and phase two of the intervention. Important to note is that, while all groups improved in upper-body strength, no significant differences existed between the groups after 20 weeks. This suggests a combination aerobic and resistance training intervention can produce substantial strength benefits quickly and then maintain these benefits as the program progresses. However, activity maintenance is necessary to keep strength, as indicated by the C and UsC groups decreasing in strength when not enrolled in exercise.

In relation to lower-body strength, assessed by a 1-RM leg press, no significant differences were seen between or within groups at any time points. As expected, Ex and ExC experienced strength improvements during the first eight weeks ($\overline{x}_A=12$ and 8kg, respectively; median=10kg for both), while UsC and C had no median changes (UsC: $\overline{x}_A=5$kg; C: $\overline{x}_A=0$kg). Interestingly, C and UsC participants had the greatest overall increases in leg strength following exercise ($\overline{x}_A=14$ and 15kg, respectively; median=10 and 15kg) compared to the two groups partaking in exercise for the full 20 weeks (Ex: $\overline{x}_A=6$kg, median=0kg; ExC: $\overline{x}_A=8$kg, median=10kg). However, this finding may have been influenced by one Ex and one ExC participant sustaining ankle injuries outside of the program during the second half of their enrolment in the intervention. This resulted in a 30-kg strength decline in one
subject and a 20-kg decline in the other. Additionally, the lack of significant changes from one assessment to the next may have been in part to the use of a 1-RM test, which may be harder to consistently administer. The machine used for this test only allowed for increases in 10-kg increments, and was also poorly designed for shorter subjects. A different machine or strength assessment tool may have yielded more significant improvements.

**Flexibility.** Maintaining flexibility is important for overall muscular fitness and functionality. The sarcopenic obesity commonly resulting from breast cancer treatment means a loss of lean body mass. This decrease leads to a decline in muscle extensibility, which is likely to translate into poorer flexibility (Schneider et al., 2007). The results of this study indicate an overall improvement in flexibility of 2.7 cm following the exercise program. This is important as it may indicate a maintenance of muscular fitness and lean body mass, though follow-up assessment is necessary to confirm these possibilities. Only one other study could be found that monitored flexibility before and following a combined aerobic and resistance training program, involving both breast and prostate cancer survivors (Schneider et al., 2007). Participants still undergoing cancer treatment had an average increase of 1 cm, while the following-treatment group improved by 1.8 cm. Later studies should aim to assess this parameter in conjunction with lean body mass to examine if a relationship does exist. If so, it may be important for interventions to ensure a program component is aimed at increasing flexibility.

Ex, ExC, and C all improved flexibility over the first eight weeks of the study (Ex: $\bar{x}_\Delta=1.7$ cm, median=1.5 cm; ExC: $\bar{x}_\Delta=3.8$ cm, median=3 cm; C: $\bar{x}_\Delta=0.8$ cm, median=1 cm), while UsC experienced a decline ($\bar{x}_\Delta=-0.25$ cm, median=-0.5 cm). The unexpected improvement in the C group is likely from one participant increasing flexibility by 8 cm during this time, though it is unknown why this change may have occurred. By the end of 20 weeks, C, Ex, and ExC participants had all increased flexibility, while UsC participants had all increased flexibility, while UsC experienced no change once beginning exercise and counselling, resulting in a mean 20-week delta value of -0.25 cm and median value of -1.5 cm. The fact that this group had the lowest exercise adherence ($\bar{x}=69\%$,
compared to overall ($\bar{x}=77.15\%$) may have contributed to the decline observed in flexibility, as this parameter must be continually targeted to maintain and improve.

**Limitations**

Several potential limitations exist in this study. Firstly, recruitment partly relied on participants self-referring themselves to partake in the study. Irwin and colleagues found participant accrual rates higher among those who self-refer when compared to subjects recruited via a registry (2008). Those who were referred to the current program by a medical practitioner still had to initiate contact with the researchers and volunteer to participate. It is possible that women volunteering for the study, either through self-referral or following another’s recommendation, may not accurately reflect the general breast cancer population (Lönnqvist, Paunonen, Verkasalo, Leikas, Tuulio-Henriksson, and Lönnqvist, 2007). As a result, the study’s external validity is affected, as findings can only be generalised to those who would likely volunteer to participate in a similar research project.

Additionally, the small sample size (n=19) and characteristics of the participants significantly limits the external validity and effect size of the study findings. Distributing the 19 participants among 4 sub-groups further hinders the ability to detect significant changes, as one outlier has the potential to skew overall results. Utilising a larger sample size would minimise the impact of outliers and generate stronger findings, whereas at the moment results from this study must be interpreting with caution due to the significant potential effect of outliers.

In regards to the study population, participants were below the general average age of first diagnosis (population $\bar{x}=60$ years; study $\bar{x}=52$ years) and of good average strength and cardiovascular fitness compared to population norms (AIHW & AACR, 2008). Most women lived in the suburban areas surrounding the study location and were not limited by common participation barriers like travel difficulties or full-time work commitments. These baseline results, therefore, limit the generalisibility of findings to more urban, middle-age, fitter breast cancer survivors. This is important to note, as studies have suggested less functional, older, and more rural populations.
may exhibit different responses and adherence to these types of programs (Karvinen et al, 2007, Koopman et al., 2001).

The small number of participants per group also increased the impact of external events on overall findings. When there are large groups, sickness or injury in individual subjects leading up to assessment points may negatively impact physiological results, but the data from other participants are able to minimise this effect on overall findings. With psychological assessment tools like the Stanford Emotional Self-Efficacy Scale-Cancer, one important factor for validity is test-retest reliability. Larger studies have adequate participant numbers to compensate for personal situations that may arise at assessment time and impact this test-retest reliability. This pilot study likely did not have the numbers per group to compensate for such incidences, with specific examples observed being follow-up appointments shortly after eight-week assessment time or cancer diagnosis of a family member just prior to final assessment.

With any subjective measurement, emotional self-efficacy scores were susceptible to a response shift. This was especially possible once participants began counselling sessions. When first completing the Stanford Emotional Self-Efficacy scale, women may not have consciously aware or completely honest with how they were functioning emotionally and socially. As sessions with the counsellor explored the areas assessed by the scale and allowed the women to truly recognise and start addressing issues, it may have impacted how they next completed the questionnaire. Since all groups began counselling at different times during their program, this may have affected differences observed between groups. Follow-up study would be necessary to address these potential issues.

With physiological assessments, specifically in relation to cardiovascular and strength testing, there exists the possibility of learned behaviour impacting results. When participants completed the baseline assessment, many of them had never walked on a treadmill, done a bench press, or been exposed to components of the other tests. Testing the participants again at eight weeks may have led to results that reflected both actual changes and the impact of increased familiarity with the test.
This would make improvements appear greater than what they were, and declines less severe. Test-retesting a few days after initial assessment might be one way of addressing this limitation.

Another potential limitation was the study design utilised. Having participants in one of four treatment groups for the first eight weeks only may not have been long enough to truly elicit significant differences in the examined outcomes. However, it can only be assumed that a longer initial separation would have resulted in greater differences between treatment modalities. Further longer-term study is needed to confirm this. Also, exercise adherence rates can only be related to programs of similar length (12 weeks or 20 weeks, depending on treatment group). Since longer-term maintenance of physical activity is important for issues of overall health and even survival, this study is limited in its ability to predict future exercise behaviour and continuation of observed benefits (Holmes et al., 2005).

Participant recruitment may have been negatively impacted by the use of the term “counselling” in program advertisements. Despite increased growth in the public setting and knowledge about counselling services (Agnew, 2003), there sometimes still exists a reluctance to utilise these services. Richardson and Handal sampled opinions on counselling and psychotherapy and found participants felt therapy could be effective in 26 to 50% of cases, taking at least 4 months for noticeable improvements (1995). Additionally, the sample was only moderately likely to seek this type of help if suffering from mental disturbance. Given these findings, it is possible potential participants for the current study may have been deterred by the program not guaranteeing more than three months of counselling of all groups. Additionally, women may have felt they were not experiencing substantial mental problems and therefore put off by the inclusion of a counselling component. Some of the participants in the study also mentioned they were hesitant to initially partake because women of their age and socioeconomic status are often encouraged to internalise personal difficulties and pretend to cope for the sake of family and friends.
Finally, low statistical power limited the ability to fully highlight effects brought about by the program. Participant baseline scores of the physical and psychological variables of interest may have been at high enough levels to limit the amount of change achievable in 20 weeks. If individuals with lower baseline functioning had volunteered for the study, they may have been more likely to show greater improvements and therefore yield more significant results. The presence of overall changes between groups in opposing directions without significant differences revealed by analyses highlights the insufficient power. For example, both Ex and ExC decreased percent body fat over the first eight weeks, while C and UsC exhibited an increase, but nonparametric testing revealed no difference between groups. Small sample size also has a large impact on analysis outcomes, as one or a few subjects with unexpected results can impact overall findings and significance. This is evident in the discrepancies between a group’s median and mean values for variables like baseline emotional self-efficacy and strength. An additional example was the Ex group actually decreasing mean cardiorespiratory endurance over the second half of the intervention. This was the result of two participants decreasing in aerobic fitness after they had initially improved in the first eight weeks. Larger sample sizes create a greater buffer for incidences like this, helping improve statistical power.

**Recommendations**

Based on the limitations of this study, care should be taken with interpreting the findings. Conducting this pilot study provided a useful insight into the feasibility and efficiency of a combined exercise and counselling program, and the following recommendations may be useful in designing follow-up studies. Additionally, these suggestions may also be beneficial if attempts are made to implement such a program in the community setting.

**Sampling.** A larger sample size is desirable to increase the potential for achieving statistically significant findings, and to decrease the ability of one or two participants’ inconsistent scores to impact group and overall results. Additionally, more participants decrease the impact of losing subjects, especially in relation to the usual care group, where retainment after eight weeks may be most challenging.
Increasing sample size may result in a group more representative of the larger population. Conducting the intervention at a few different sites throughout the community may also produce a more heterogeneous sample, though this may lead to consistency issues among locations.

Larger subject numbers will likely eliminate the baseline differences observed in this study in relation to age and radiation treatment. Obtaining a sample that is statistically equal at baseline provides a better indication of whether observed changes are more related to program participation rather than personal characteristics. Further study may also wish to stratify groups based on treatment received to examine if this type of intervention is more beneficial to certain sub-populations. Groups could also be based on age or BMI, as Visovsky emphasised older and obese populations may benefit significantly from such programs but often have difficulty adhering (2006). Examining their psychological baseline and response to a combined exercise and counselling program may give an indication of areas related to adherence and help highlight ways to better aid these often neglected groups.

**Recruitment.** The recruitment methods utilised in this study, and the resulting low level of initial success, highlight the need for a revised approach. Though advertisements were distributed to numerous cancer-related groups and posted in relevant areas of most local hospitals, a longer recruitment period may have resulted in greater subject numbers as women and healthcare staff became more aware of the program and word-of-mouth advertisement increased. Additionally, a more active recruitment approach could have been utilised rather than relying on subject self-referral. Flyers could also have been mailed to participants from hospital and support-group databases, as well as attending more breast cancer events and personally distributing information sheets. This might have aided in decreasing the potential impact of differences sometimes observed between research volunteers and the rest of the population.

Also, exclusion of the term “counselling” from adverts may have an impact on recruitment. The program could be promoted as one aimed to produce physical and
psychological benefits, and then explain the specific structure once women express initial interest. Care may also be taken in emphasising that exercise will be tailored to each individual, hopefully encouraging women of all baseline fitness levels to partake.

**Study Design.** Future studies of longer durations are recommended, as are ones with group separation lasting more than eight weeks. This will allow for better observation of the separate benefits of exercise alone and counselling alone, as compared to a combination program. Also, longer-term programs may increase the chance of producing more significant improvements in physical parameters like body composition that take longer to change. Psychological variables are also likely to improve more over a longer term, as the initial stages of a program may be spend on simply acknowledging issues rather than learning how to address them.

As exercise is something that must be maintained to be beneficial, longer-term interventions and post-program follow-up are important to observe adherence and continuation rates. The current study saw a drop in adherence in the two exercise groups during the second phase of the program, so it is important to see if this trend continues once the program concludes or is extended. If declined participation is noted, it becomes essential to identify factors influencing this decrease in adherence. Identifying these variables could allow the development of future programs better designed to address such motivational factors and hopefully promote better activity maintenance.

Future study may also wish to compare psychological and physiological changes between a gym-based exercise group and a home-based exercise group, better allowing women who may work full-time or have travel barriers to partake in physical activity. Recent research has compared a telephone exercise group and a face-to-face exercise group to a usual care control and found similar improvements in quality of life for both exercise groups (Di Sipio et al., 2009). Additionally, both exercise groups increased their walking levels over the study duration, and it would interesting to see if such a program could equally improve areas like emotional self-efficacy as well (Harrison, Eakin, Newton, Guy, Di Sipio, and Hayes, 2009).
Though one-on-one counselling was utilised in this study, future research could be conducted examining the efficiency of group or peer counselling as well. Group counselling may be easier to implement in a community setting, but does not allow the patient-centred, individualised approach taken in this intervention. Peer counselling better addresses that drawback, though care needs to be taken in carefully training the peer counsellor and ensuring she is not negatively impacted by the experience (Giese-Davis et al., 2006). Also, as not all breast cancer survivors can easily access counselling services, especially those living in rural areas, it would be worthwhile to explore the feasibility of delivering phone- or computer-based counselling.

Assessment. Future research may utilise different tools for assessments. Though skinfolds are suggest to be relatively accurate in measuring percent body fat, they are still subject to researcher error and do not allow monitoring of lean body mass changes. Additionally, care needs to be taken when deciding on the sites to utilise for measurement, as common sites like the chest, midaxilla, and abdomen may be altered due to mastectomy and reconstruction surgeries. Research has found older women, like most of the participants in this study, accumulate body fat in the form of visceral adipose tissue rather than subcutaneous adipose tissue, which cannot be measured by skinfolds (Zamboni et al., 1997). Ideally, a DEXA may provide the most thorough assessment, allowing testing of overall body composition and bone health as well. This may be an important component to monitor in future studies, as breast cancer women are at a higher risk for osteoporosis due to average age, and potentially from treatment regime. Women on aromatase inhibitors are at an increased risk due to the therapy blocking oestrogen synthesis and its positive effect on bone health.

Additional research may also utilise other tools to assess muscular strength. Though the YMCA bench press protocol proved effective in monitoring strength gains, test termination was relatively subjective. Some women admitted to stopping due to boredom or having reached a certain number, despite likely having been able to continue. Additionally, some women were uncomfortable with the use of an unsupported bar and unfamiliarity with how to perform a bench press. Unfamiliarity
with exercise performance may have also impacted 1-RM leg press results. Additionally, the machine utilised only allowed 10-kg weight increases and was not designed for shorter participants. Future research may wish to utilise a different assessment or other style of machine. A 3-RM seated chest press and leg press or a combination muscle strength assessment protocol, like the one utilised by Milne et al. (2008), may provide a better representation of strength.

Studies may wish to better monitor upper-body function through range of motion assessments and comparison of surgery versus non-surgery side, if applicable. Care should also be taken in noting whether unilateral surgery was performed on the dominant or non-dominant side. Hayes and colleagues found women six months post-surgery exhibited better upper-body functioning, assessed via objective measures, when treatment had occurred on the dominant side (2005). This has important implications for developing individualised exercise programs and monitoring improvements. Additionally, lymphoedema has been found up to 80% more common when treatment is on the non-dominant rather than dominant side, making it important to collect treatment and dominance information during initial assessments (Hayes, Cornish, & Newman, 2005).

One additional parameter that may be important for future studies to assess is balance. Commonly seen to decline with age in the general population, breast cancer patients may further decline following treatment, as chemotherapy can result in neuropathy issues. Additionally, due to women on aromatase inhibitors having an increased fracture risk, good balance is important for falls prevention. A simple timed stork test may be sufficient in tracking balance improvements.

Psychological assessment is always difficult, as it typically relies on subject-reported data and often tries to quantify more qualitative variables. Future research may include more counsellor-based assessment and qualitative attempts to monitor psychosocial functioning. Additionally, parameters such as self-esteem and coping may be important to assess in conjunction with emotional self-efficacy, as these issues have been show to relate. Motivation, especially intrinsic motivation, is a beneficial parameter to assess, as it is essential for adherence and may also link with
a woman’s self-efficacy. Care also needs to be taken to ensure that women are aware of what a questionnaire is asking, as many of the current study’s participants mentioned occasional confusion about what some questions meant.

At the conclusion of an intervention like this, it may be helpful to conduct qualitative exit interviews. This would allow discovery of potential changes needed in future studies, and more importantly, it provides a chance to get an idea of the program’s impact that cannot be captured by physical or psychological tests. Even when improvements, or potentially consequences, are not evident in quantitative results, that does not mean they do not exist. It is important to capture how a woman feels the program affected her, even if results do not fully reflect this.

Interventions. As this study was conducted in a university setting with small participant numbers, it was possible to supply a trainer for each participant and ensure individualised exercise programs. A larger-scale study or community program may not have adequate resources to implement this though. Research should explore the feasibility of a group exercise structure rather than spreading out participants to allow for more one-on-one training. This suggestion comes following feedback from some participants in the current study. They commented that exercising with other participants, even if doing different workouts, often motivated them to come in and helped them push themselves and realise they were not alone in their situation. Such findings are important to investigate further, and may provide support for implementation of community group programs.

Regardless of whether training is administered in a group or one-on-one setting, it is imperative to recognise variations in participant’s fitness levels. As each woman undergoes a unique treatment regime and responds differently, it is necessary to tailor exercise based on this. Surgical treatment will impact areas like range of motion and muscle imbalances, while each chemotherapy or hormone therapy protocol is associated with varying side effects capable of impacting physical and psychological function. Hence, it may be most beneficial to begin an individual in a personalised one-on-one exercise program to examine functional abilities and
limitations. Once basic exercise knowledge and confidence is obtained, a group program may be feasible.

As weight gain has been identified as one of the greatest concerns in post-treatment women, it may be beneficial to incorporate some form of diet education and monitoring in future studies (Ganz et al., 1996). In order to successfully achieve noticeable, long-term weight loss, an overall lifestyle change is necessary incorporating both exercise and healthy eating habits (Demark-Wahnefried et al., 2007).

**Conclusion**

Findings from this study indicate marginally significant differences between C, Ex, ExC, and UsC in improving emotional self-efficacy over eight weeks. Both Ex and C in isolation appear capable of increasing self-efficacy scores, and combining the two modalities produces a similar positive outcome, while no treatment actually negatively impacts emotional self-efficacy levels. Additionally, the overall increase in emotional self-efficacy in all groups at the end of the 20-week program suggests as little as 12 weeks of exercise and counselling is sufficient to produce a catch-up effect in participants’ scores, regardless of prior intervention. Further study is warranted to observe if these positive changes in self-efficacy can be maintained long-term.

This study also examined physiological improvements in body composition, cardiorespiratory endurance, muscular strength, and flexibility, finding significant differences between groups in upper body strength after the first 8 weeks, and significant differences between groups from week 8 to week 20 in cardiorespiratory endurance improvements. The eight-week strength increase observed in Ex and ExC and decrease seen in C and UsC support the expectation that exercise is capable of producing significant physical improvements, with the remaining physiological parameters improving in the Ex and ExC groups as well, though not significantly. Further, the marginally significant 12-week increases in cardiorespiratory endurance, strength, and flexibility observed in C, once these participants enrolled in the exercise component, suggests 12 weeks of activity is sufficient to produce notable
improvements. Longer studies, especially those with post-intervention follow-up, are necessary to examine if these positive physiological improvements can be maintained through continued exercise, as maintenance of physical activity has important implications for overall health and survivorship (Holmes et al., 2005).

Results did not support the hypothesis that higher baseline self-efficacy levels would be correlated with greater adherence and physiological improvements, but it was found that lower baseline emotional self-efficacy actually correlated with greater overall improvements in self-efficacy scores and flexibility. Also of interest was that the two subjects who dropped out of the study had the lowest baseline emotional self-efficacy scores. Pre-screening baseline self-efficacy may enable the identification of those who are at a higher risk of poor or no adherence to an exercise and counselling program. By recognising these individuals, it may be possible to provide them additional support, as they are likely the ones in greatest need of an intervention like the one in this study, though further study is needed. As the small number of participants in this pilot study limits the ability to observe significant correlations, follow-up research with larger participant numbers is warranted to further examine potential relationships between emotional self-efficacy and adherence and physiological improvements. If lower self-efficacy levels are again found linked with greater psychosocial and physiological improvements, it may be possible to determine survivors most likely to benefit from such an intervention by monitoring self-efficacy levels. Additionally, a potential relationship between emotional self-efficacy, counselling adherence, and exercise adherence needs to be examined further, as small subject numbers and a lack of detailed monitoring of counselling adherence may have limited the ability to fully explore potential correlations.

Study findings were also unsupportive of the hypothesis that higher weight gain would correlate with lower emotional self-efficacy, with results actually suggesting participants with the greatest increases in weight and BMI actually had higher final emotional self-efficacy levels. Again, these findings should be interpreted with caution owing to the small subject numbers. As previous research has not examined the weight gain and self-efficacy correlation in exercise or counselling interventions,
a larger-scale study is warranted. It may also be beneficial to examine body image and self-esteem in correlation with weight changes and emotional self-efficacy, as these are some of the primary long-term issues breast cancer survivors often struggle with.

Though caution should be taken in interpreting the findings of this pilot study, this research has shown a short-term combination exercise and counselling program is effective in producing both psychological and physiological improvements. Additionally, engaging in such a program appears unlikely to produce adverse effects, especially in relation to lymphoedema. However, further investigation is necessary to confirm these initial findings, and also to see if benefits can be maintained long-term, as this is important for overall quality of life and potentially decreased cancer mortality. If additional research continues to support these preliminary findings, it may be possible to finally offer breast cancer survivors a more complete recovery, decreasing both the psychological and physiological side effects of cancer.
References


Courneya, K. S., Segal, R. J., Gelmon, K., Reid, R. D., Mackey, J. R., Friedenreich, C. M., et al. (2007a). Six-month follow-up of patient-rated outcomes in a randomized controlled trial of exercise training during breast cancer
chemotherapy. *Cancer Epidemiology, Biomarkers, and Prevention, 16*(12), 2572-2578.


Lermen, J., Bruce, R.A., Sivarajan, E., Pettet, G., & Trimble, S. (1976). Low-level dynamic exercises for earlier cardiac rehabilitation: aerobic and


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APPENDIX A

Participant Information Letter, Consent Form, Medical Questionnaire, and PAR-Q
Dear potential participant,

We are so excited that you are interested in being a part of the Get REAL & HEEL Breast Cancer Program. With breast cancer as the most common cancer experienced by Australian women, and survival rates rising, enhanced and extended treatment becomes necessary. By aiding women in developing physical and psychological strength to deal with the debilitating side effects of treatment, recovery and coping may be improved. Developing an approach that addresses both the physical and psychological hardships existing after breast cancer treatment aids in developing this strength. Exercise and counselling have been shown to be two such useful strategies. Therefore, the aim of this project is to provide valuable information on the benefits of a combined exercise and counselling program on the health and well-being of breast cancer survivors.

Certain participant requirements exist, as outlined below:

1. This study is a 5-month combined exercise and counselling program. Each participant will be required to undergo a battery of psychological assessments including fatigue, body esteem, depression and quality of life scales. Each subject will also be required to undergo fitness assessments including cardiovascular fitness, strength, balance, flexibility and body composition.

2. Subjects will then be randomly assigned to one of four groups: an exercise-only group, a counselling-only group, an exercise and counselling group, or a delayed-treatment control group. The control group will undergo normal care as directed by your doctor. At the end of a two-month period, the control subjects will then be enrolled in a personalised exercise and counselling program for the remaining 3 months. Subjects in the exercise-only group will participate in prescriptive exercise 3 times per week for the first 2 months before adding the counselling component one time a week for the remaining 3 months. Subjects in the counselling-only group will partake in individual counselling sessions one time a week for the first 2 months, then add an exercise program 3 times a week for the remaining 3 months. With the exercise and counselling group, participants will undertake prescriptive exercise 3 times per week and one session of counselling per week for the full 5 months.

3. This study is voluntary and you are under no obligation to take part in the study. You may withdraw from the study at any time with no hindrance of access to appropriate care.

4. Data will be stored securely in the School of Health Sciences at The University of Notre Dame Australia for five years.

5. All testing and training sessions will be performed on campus at the University of Notre Dame Australia, Fremantle Campus, at the Institute for Health and Rehabilitation Research.
Due to the physical demand associated with undertaking an exercise program, a slight risk exists for soreness, injury, and acute medical complications. To minimize this, all exercise sessions will be closely monitored by trained and competent staff. Additionally, for those assigned to the combination exercise and counselling group, short-term emotional distress may result from discussion of your breast cancer experience during the counselling component. Trained counselling staff will be prepared for this possibility and able to assist you in addressing any issues that may arise.

This study is an attempt to support the findings suggesting a positive effect of exercise and examine the benefit of adding a counselling aspect. If implementation of such a program appears successful, it could have applications for breast cancer survivors throughout Australia.

Approval of this study has been obtained from the Human Research Ethics Committee of the University of Notre Dame Australia.

Should you have any further questions about the project or concerns about the manner in which the project is being conducted, please feel free to contact Jena Buchan, program coordinator, or Dr. Fiona Naumann, program director and an accredited Exercise Physiologist:

Jena Buchan  
Tel: 045 044 5067  
Email: jbuchan1@nd.edu.au

Dr. Fiona Naumann  
Tel: (08) 9433 0906  
Email: fnaumann@nd.edu.au.

We thank you for your time and consideration look forward to speaking with you soon.

Yours sincerely,

Miss Jena Buchan                     Dr. Fiona Naumann

If participants have any complaint regarding the manner in which a research project is conducted, it may be given to the researcher or, alternatively, to the Provost, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0846.
The Effects of a Combined Exercise and Counselling Program on Selected Physiological and Psychological Parameters in Post-Treated Breast Cancer Patients

Informed Consent Form

I, (participant's name) ________________________________________________

hereby agree to being a participant in the above research project.

- I have read and understood the Information Sheet about this project and any questions have been answered to my satisfaction.
- I realise that I may withdraw from the project at any time without prejudice.
- I understand that all information gathered will be treated as strictly confidential.
- I agree that research data gathered for the study may be published provided my name or other identifying information is not disclosed.

Signed (participant) : __________________________ Date : __________

Name of researcher: __________________________

Signed (researcher) : __________________________ Date : __________

If participants have any complaint regarding the manner in which a research project is conducted, it may be given to the researcher or, alternatively, to the Provost, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0846.
## Patient Information / Medical History

Please provide us with the information below to the best of your ability. Check Yes/No when it applies.

### Section A:

<table>
<thead>
<tr>
<th>Surname</th>
<th>First Name</th>
<th>Other Given Names</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<table>
<thead>
<tr>
<th>Address</th>
<th>Suburb</th>
<th>Postcode</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Home Phone</th>
<th>Work/Mobile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Email Address</th>
<th>Date of Birth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Contact Name</th>
<th>Emergency Contact Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Oncologist Name</th>
<th>Oncologist Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- What is your specific diagnosis? _______________________________________________________________________
- When were you diagnosed? _____________________________________________________________________________
- When did you complete treatment? _____________________________________________________________________

### Race:

- White
- Asian/Pacific Islander
- Other __________________
- Black
- Hispanic

### Primary Language:

- English
- Other __________________

### Marital Status:

- Married
- Single
- Partner
- Divorced
- Widowed

- Spouse/Partner’s Name: ________________________________________

- When is your anniversary? ____________________________________

- Do you have any children? □ Yes □ No
  - If yes, how many? ____________
  - Are you able to write? □ Yes □ No
Are you able to read?  □ Yes  □ No
What is the last year in school you completed?

What is your present work status? (check all that apply)
□ Full-time
□ Part-time
□ Student
□ Domestic Work
□ Unemployed
□ Other (Please specify)

Will you need assistance with parking?  □ Yes  □ No
Do you have any special needs that we should be aware of?  □ Yes  □ No
If yes, please explain.

How did you learn about the Get R.E.A.L. and Heel Breast Cancer Program?

Section B:

• When was the last time you had a physical examination?____

• If you are allergic to any medications, foods, or other substances, please name them.

• If you have been told that you have any chronic or serious illnesses, please list them.

• Give the following information pertaining to the last 3 times you have been hospitalized. *Note:* Do not list normal pregnancies.

<table>
<thead>
<tr>
<th>Hospitalization</th>
<th>Hospitalization</th>
<th>Hospitalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason for</td>
<td>Hospitalization</td>
<td>Hospitalization</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Reason for</td>
<td>Hospitalization</td>
<td>Hospitalization</td>
</tr>
</tbody>
</table>

116
Month & Year
Of hospitalization
Hospital
Suburb and State

Section C:

During the past 12 months

1. Has a physician prescribed any form of medication for you? Yes □ No
2. Has your weight fluctuated more than a few pounds? Yes □ No
3. Did you attempt to bring about this weight change through diet or exercise? Yes □ No
4. Have you experienced any faintness, light-headedness, or blackouts? □ Yes □ No
5. Have you occasionally had trouble sleeping? □ Yes □ No
6. Have you experienced any blurred vision? □ Yes □ No
7. Have you had any severe headaches? □ Yes □ No
8. Have you experienced chronic morning cough? □ Yes □ No
9. Have you experienced any temporary change in your speech pattern, such as slurring or loss of speech? Yes □ No
10. Have you felt unusually nervous or anxious for no apparent reason? □ Yes □ No
11. Have you experienced unusual heartbeats such as skipped beats or palpations? □ Yes □ No
12. Have you experienced periods in which your heart felt as though it was racing for no apparent reason? □ Yes □ No

At Present

1. Do you experience shortness or loss of breath while walking with others your own age? □ Yes □ No
2. Do you experience sudden tingling, numbness, or loss of feeling in your arms, hands, legs, feet, or face? □ Yes □ No
3. Have you ever noticed that your hands or feet sometimes feel cooler than other parts of your body? □ Yes □ No
4. Do you experience swelling of your feet and ankles?  □ Yes  □ No  
5. Do you get pains or cramps in your legs?  Yes  □ No  
6. Do you experience any pain or discomfort in your chest?  Yes  □ No  
7. Do you experience any pressure or heaviness in your chest?  Yes  □ No  
8. Have you ever been told your blood pressure is abnormal?  Yes  □ No  
9. Have you ever been told that your serum cholesterol or triglyceride level was high?  Yes  □ No  
10. Do you have diabetes?  Yes  □ No  

    If yes, how is it controlled?  
    □ Dietary means  □ Insulin injection  
    □ Oral medication  □ Uncontrolled  

11. How often would you characterize your stress level as being high?  
    □ Never  □ Occasionally  □ Frequently  □ Constantly  

12. Have you ever been told that you have any of the following illnesses?  
    □ Myocardial Infarction  □ Arteriosclerosis  □ Heart disease  
    □ Coronary thrombosis  □ Rheumatic heart  □ Heart attack  
    □ Coronary occlusion  □ Heart failure  □ Heart murmur  
    □ Heart block  □ Aneurysm  □ Angina  

Section D:  
Has any member of your immediate family been treated for or suspected to have had any of these conditions? Please identify their relationship to you (father, mother, sister, brother, etc.).  

A. Diabetes  
B. Heart disease  
C. Stroke  
D. High blood pressure
For Office Use Only

Physician Comments & Recommendations: 

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

119
PAR - Q & YOU
(A Questionnaire for People Aged 15 to 69)

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

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

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

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

YES to one or more questions
Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES:
• You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
• Find out which community programs are safe and helpful for you.

If you answered NO to all questions, you can be reasonably sure that you can:
• start becoming much more physically active — begin slowly and build up gradually. This is the safest and easiest way to go.
• take part in a fitness appraisal — this is an excellent way to determine your basic fitness so that you can plan the best way for you to increase activity. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

Please note: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional.

DELAY BECOMING MUCH MORE ACTIVE:
• If you are not feeling well because of a temporary illness such as a cold or a fever — wait until you feel better; or
• If you are or may be pregnant — talk to your doctor before you start becoming more active.

Continued on other side...

You are encouraged to copy the PAR-Q but only if you use the entire form

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

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

NAME ________________________________ DATE ________________________________

SIGNATURE ________________________________ WITNESS ________________________________

SIGNATURE OF PARENT or GUARDIAN (for participants under the age of majority) continued on other side...

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Société canadienne de physiologie de l’exercice

Supported by: Health Canada Santé Canada

APPENDIX A.1
We know that being physically active provides benefits for all of us. Not being physically active is recognized by the Heart and Stroke Foundation of Canada as one of the four modifiable primary risk factors for coronary heart disease (along with high blood pressure, high blood cholesterol, and smoking). People are physically active for many reasons — play, work, competition, health, creativity, enjoying the outdoors, being with friends. There are also as many ways of being active as there are reasons. What we choose to do depends on our own abilities and desires. No matter what the reason or type of activity, physical activity can improve our well-being and quality of life. Well-being can also be enhanced by integrating physical activity with enjoyable healthy eating and positive self and body image. Together, all three equal VITALITY. So take a fresh approach to living. Check out the VITALITY tips below!

**Active Living:**
- accumulate 30 minutes or more of moderate physical activity most days of the week
- take the stairs instead of an elevator
- get off the bus early and walk home
- join friends in a sport activity
- take the dog for a walk with the family
- follow a fitness program

**Healthy Eating:**
- follow Canada’s Food Guide to Healthy Eating
- enjoy a variety of foods
- emphasize cereals, breads, other grain products, vegetables and fruit
- choose lower-fat dairy products, leaner meats and foods prepared with little or no fat
- achieve and maintain a healthy body weight by enjoying regular physical activity and healthy eating
- limit salt, alcohol and caffeine
- don’t give up foods you enjoy — aim for moderation and variety

**Positive Self and Body Image:**
- accept who you are and how you look
- remember, a healthy weight range is one that is realistic for your own body make-up (body fat levels should neither be too high nor too low)
- try a new challenge
- compliment yourself
- reflect positively on your abilities
- laugh a lot

Enjoy eating well, being active and feeling good about yourself. That’s **VITALITY**.

---

**FITNESS AND HEALTH PROFESSIONALS MAY BE INTERESTED IN THE INFORMATION BELOW.**

The following companion forms are available for doctors' use by contacting the Canadian Society for Exercise Physiology (address below):

The Physical Activity Readiness Medical Examination (PARmed-X) - to be used by doctors with people who answer YES to one or more questions on the PAR-Q.

The Physical Activity Readiness Medical Examination for Pregnancy (PARmed-X for PREGNANCY) - to be used by doctors with pregnant patients who wish to become more active.

References:

To order multiple printed copies of the PAR-Q, please contact the

Canadian Society for Exercise Physiology
185 Somerset St. West, Suite 202
Ottawa, Ontario CANADA K2P 0J2
Tel. (613) 234-3755 Fax: (613) 234-3565

The original PAR-Q was developed by the British Columbia Ministry of Health. It has been revised by an Expert Advisory Committee assembled by the Canadian Society for Exercise Physiology and Fitness Canada (1994).

Depositez en français sous le titre «Questionnaire sur l'aptitude à l’activité physique - Q-AAP (révisé 1994).»

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"Compétent canadienne de physiologie de l'exercice"

Supported by: Health Canada Santé Canada

APPENDIX A.1
APPENDIX B

Stanford Emotional Self-Efficacy Scale
### Stanford Emotional Self-Efficacy Scale – Cancer

Please rate your confidence in your ability to do each of the following.

<table>
<thead>
<tr>
<th></th>
<th>Not at all confident</th>
<th>Completely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Let my friends know when I am angry because of something they did.</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>2. <strong>Directly consider the thought that I might die.</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>3. <strong>Be with people or do things without being distracted by painful emotions or anxious thoughts.</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>4. <strong>Ask for the emotional support I need from my spouse/partner or closest friend</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>5. <strong>Focus my full attention on one thing at a time.</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>6. <strong>Consider any issue at all while remaining calm and feeling centered.</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>7. <strong>Express love, affection, caring to my spouse/partner or closest friend</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>8. <strong>Talk about my possible death with my spouse/partner or closest friend</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>9. <strong>Talk to my doctor about fears that I have about dying.</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td>10. <strong>Stay calm while waiting for the results of medical tests.</strong></td>
<td>0 10 20 30 40 50 60 70 80</td>
<td>90 100</td>
</tr>
<tr>
<td></td>
<td>Not at all confident</td>
<td>10</td>
</tr>
<tr>
<td>---</td>
<td>---------------------</td>
<td>----</td>
</tr>
<tr>
<td>11.</td>
<td>Face my fears about the thought that I might die without feeling anxious all day or all night.</td>
<td>0</td>
</tr>
<tr>
<td>12.</td>
<td>Truly enjoy activities or people that are meaningful to me.</td>
<td>0</td>
</tr>
<tr>
<td>13.</td>
<td>Express sadness or cry with family members</td>
<td>0</td>
</tr>
<tr>
<td>14.</td>
<td>Cry or express other emotions I feel about dying when I am talking with someone close to me.</td>
<td>0</td>
</tr>
<tr>
<td>15.</td>
<td>Ask for the emotional support I need from family members</td>
<td>0</td>
</tr>
</tbody>
</table>
APPENDIX C

Physiological Assessment Form
Get REAL & HEEL Breast Cancer Program
University of Notre Dame Australia-Fremantle
Institute for Health and Rehabilitation Research
INITIAL ASSESSMENT: Data Collection Sheet

Date/Day of Week: 
Participant Name: 
Trainer: 

Attach the Polar Heart Rate monitor immediately after patient arrives. Heart rate monitor should not be removed until the patient completes all tests. Patient should remain seated for 5 minutes while the lowest heart rate measure is observed and recorded.

Start Time: 
Completion Time: 

BP: 
RHR: bpm
Method used for RHR: 

Pulse Oximeter Reading: SpO\textsubscript{2} \% 
Final SpO\textsubscript{2} \%

Height: cm (no shoes) 
Weight: kg (no shoes) 

BMI (weight/height\(^2\)): 
Anthropometric and Body Composition Measures

**Body Circumferences:**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Right (R)</th>
<th>Left (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gluteus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>R</td>
<td>L</td>
</tr>
<tr>
<td>Arm</td>
<td>R</td>
<td>L</td>
</tr>
<tr>
<td>Thigh</td>
<td>R</td>
<td>L</td>
</tr>
</tbody>
</table>

(pants/no pants)

**Body Composition:**

Skinfolds:

Women (Triceps, chest, subscapular, abdomen, suprailiac, midaxilla, thigh)

<table>
<thead>
<tr>
<th>Skinfold</th>
<th>Right (R)</th>
<th>Left (L)</th>
<th>Avg:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triceps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscapular</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suprailiac</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdomen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midaxilla</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thigh</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sum:_________

Generalized Prediction Skinfold Equation for Women (18-55 yr)

\[
\text{Density(Db)} = 1.0970 - 0.00046971 \times (7SKF) + 0.00000056 \times (7SKF)^2 - 0.00012828 \times \text{(age)}
\]

To convert to %BF using Siri (1961) equation

\[
\% \text{ Body Fat} = \left[ \frac{4.95}{\text{Density}} - 4.50 \right] \times 100
\]

Source: (Jackson et al., 1980)

\[
\text{Density} = 1.0970 - 0.00046971 \times (7SKF) + 0.00000056 \times (7SKF)^2 - 0.00012828 \times \text{(age)}
\]

\[
\% \text{ Body Fat} = \left[ \frac{4.95}{\text{Density}} - 4.50 \right] \times 100
\]

Jackson AS, Pollock ML. Practical Assessment of Body Composition, Phys Sport Med 1985; 13(3):
## Body Circumferences

### Standardized sites for circumference measurements

<table>
<thead>
<tr>
<th>Site</th>
<th>Anatomical Reference</th>
<th>Position</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waist</td>
<td>Narrowest part of torso, level of the “natural” waist between ribs and iliac crest</td>
<td>Horizontal</td>
<td>Apply tape snugly around waist at level of narrowest part of torso. An assistant is needed to position tape behind the client. Take measurement at the end of normal respiration.</td>
</tr>
<tr>
<td>Abdominal</td>
<td>Maximum anterior protuberance of abdomen, usually at umbilicus</td>
<td>Horizontal</td>
<td>Apply tape snugly around the abdomen at level of greatest anterior protuberance. An assistant is needed to position tape behind the client. Take measurement at the end of normal respiration.</td>
</tr>
<tr>
<td>Gluteus</td>
<td>Maximum posterior extension of buttocks</td>
<td>Horizontal</td>
<td>Apply tape around buttocks. An assistant is needed to position tape on apposite side of body.</td>
</tr>
<tr>
<td>Arm</td>
<td>Acromion process of scapula and olecranon process of ulna</td>
<td>Perpendicular to long axis of arm</td>
<td>With arms hanging freely at sides and palms facing thighs, apply tape snugly around the arm at level midway between the acromion process of scapula and olecranon process of ulna.</td>
</tr>
<tr>
<td>Forearm</td>
<td>Maximum girth of forearm</td>
<td>Perpendicular to long axis of arm</td>
<td>With arms flexed in a 90-degree position, apply tape around the largest portion of the forearm.</td>
</tr>
<tr>
<td>Thigh</td>
<td>Gluteal fold</td>
<td>Horizontal</td>
<td>Apply tape snugly around thigh, just distal to the gluteal fold.</td>
</tr>
</tbody>
</table>
Cardio-Respiratory Endurance Test

Modified Bruce Protocol: Treadmill

Karvonen Formula:

Target Heart Rate = (HR_{max}) \times \text{percent intensity}

Where:

HR_{max} = 220 - \text{age of the participant}

Percent Intensity = \text{Prescribed exercise intensity}

Target HR = (\quad \quad - \quad \quad) \times 0.75

Target HR = \quad \quad \quad \quad \quad

<table>
<thead>
<tr>
<th>Stage</th>
<th>Speed</th>
<th>Grade</th>
<th>Stage Time</th>
<th>HR</th>
<th>RPE</th>
<th>Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>2.74</td>
<td>0%</td>
<td>3 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>2.74</td>
<td>5%</td>
<td>3 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two</td>
<td>2.74</td>
<td>10%</td>
<td>3 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three</td>
<td>4.02</td>
<td>12%</td>
<td>3 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four</td>
<td>5.47</td>
<td>14%</td>
<td>3 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five</td>
<td>6.76</td>
<td>16%</td>
<td>3 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Six</td>
<td>8.05</td>
<td>18%</td>
<td>3 min</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VO_2 calculation formula: \( VO_{2\text{max}} = 2.282 \text{ (time in min.)} + 8.545 \)

\( VO_{2\text{max}} = 2.282 (\quad \quad) + 8.545 \)

\( VO_{2\text{max}} = \quad \quad \quad \quad \quad \quad \quad \)

**Muscular Strength Test**

**Hand-Held Dynamometry**

Patients will be asked to stand and hold the handgrip dynamometer in one hand lined with the forearm that will be placed beside the body. Maximum grip strength is then determined without swinging the arm and by squeezing the handgrip dynamometer as hard as possible using one brief contraction with no extraneous body movement. The test will be administered three times for each hand with a one-minute rest in between trials. The best score within the three trials will be the one that will be used for analyses.

Handgrip Dynamometry:

Right arm: Trial 1 ______, Trial 2 ______, Trial 3 ______ (Best trial: ___)
Left arm: Trial 1 ______, Trial 2 ______, Trial 3 ______ (Best trial: ___)

**Muscular Endurance Test**

**YMCA Bench Press Test:** Start metronome, set at 60 bpm. Subject lies supine on bench, knees bent flat on floor. Researcher hands 35 lb. (15.9 kg.) barbell to subject, who grips bar (overhand) shoulder width. Subject benches with pace of metronome, pressing bar upward so arm is fully extended and then returning bar to chest. Encourage subject to breath regularly and not strain during test. Stop test when subject no longer can keep pace of metronome (a little faster or a little slower rhythm is acceptable). Record successful number of repetitions.

Number of repetitions: __________

[http://www.exrx.net/Calculators/YBenchPress.html](http://www.exrx.net/Calculators/YBenchPress.html)

**1-RM Leg Press:** Set leg press recline at a 45-degree angle. Allow the participant to perform 5 reps at a light weight for warm-up, followed by a one-minute rest. Increase the weight to allow for 3-5 reps, followed by a two-minute rest period. Increase the weight to allow for 2-3 repetitions, followed by a two-minute rest. Continue increasing weight until only a 1-RM weight is reached.

Weight (kg): ____________________
Flexibility Test

Sit-and-reach: Patient must sit on the floor with feet flat against the box, hip-width apart. Make sure knees are extended (but not locked). Monitor for feet keeping contact with the box while patient extends arms forward with one hand on top of the other. Instruct the participant to slowly push the measurement bar as far as possible while keeping hands together and legs straight. Make sure the patient exhales while leaning forward and keeping the head down. Repeat this for three trials.

Trial 1 cm.
Trial 2 cm.
Trial 3 cm.

Highest Measurement cm.

Force Plate Balance Assessment

Two-leg eyes open: Participant must be barefoot while testing. Ask participant to stand on both legs with hands on hips. Participant will perform two 20-second trials. Ensure results are labeled and saved on computer.

Two-leg eyes closed: Participant will perform two 20-second trials. Ensure results are labeled and saved on computer.

Single-leg eyes open: Instruct participant to stand with hands on hips and stand on dominant leg upon commencement of 20-second trial. Conduct two trials, and repeat for nondominant leg. Ensure results are labeled and saved on computer.

Leg 1 (R/L) ___________ Leg 2 (R/L) ___________
Shoulder Range of Motion

Instruct participant to stand with back against wall and palms facing forward.

- Range-of-motion assessment in the coronal plane, palms facing forward – maximum 180°

Right ______°    Left ______°

- Evaluation of active external rotation; patient’s elbows and arms are resting at her sides – maximum 90°

Right ______°    Left ______°

- Internal rotation as measured from the vertebral bodies posteriorly.

Right ______ cm    cm    Left ______ cm
APPENDIX D

Sample Exercise Program and Home Exercise Log
<table>
<thead>
<tr>
<th>Date</th>
<th>Warm-up/ Cardio</th>
<th>Exercise</th>
<th>Rep</th>
<th>Sets, intensity, etc.</th>
<th>Rep</th>
<th>Sets, intensity, etc.</th>
<th>Date</th>
<th>Exercise</th>
<th>Rep</th>
<th>Sets, intensity, etc.</th>
<th>Rep</th>
<th>Sets, intensity, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Treadmill bike</td>
<td></td>
<td>Speed=</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pole</td>
<td></td>
<td>Overhead/ back stretches</td>
<td>5</td>
<td>X1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOSU</td>
<td></td>
<td>Knee pushups</td>
<td>6</td>
<td>X2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td></td>
<td>Walking lunge</td>
<td>10/ leg</td>
<td>X2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td></td>
<td>SL L raises + shoulder press</td>
<td>12</td>
<td>X2, 3kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CARDIO</td>
<td></td>
<td>Rower</td>
<td>2m</td>
<td>20s sprint, 10s rest</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cables</td>
<td></td>
<td>Chest fly</td>
<td>10</td>
<td>X2, 5 kg</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mach</td>
<td></td>
<td>Back ext</td>
<td>15</td>
<td>X2, 30kg</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Cables</td>
<td></td>
<td>Lat pulldown on fitball</td>
<td>12</td>
<td>X2, 15 kg (single cables)</td>
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<tr>
<td>Mach</td>
<td></td>
<td>Single-leg press</td>
<td>10/ leg</td>
<td>X2, 20kg</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>CARDIO</td>
<td></td>
<td>Rower</td>
<td>2m</td>
<td>15s sprint, 15s rest</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pilates</td>
<td></td>
<td>Overhead/side arms</td>
<td>6/ way</td>
<td>X1, 1.5 springs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilates</td>
<td></td>
<td>Tricep ext</td>
<td>10</td>
<td>X1, 1.5 springs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOSU</td>
<td></td>
<td>SL balance</td>
<td>30s</td>
<td>X2/leg</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Comments/ Changes**

**Cool Down**

**Comments/ Changes**
<table>
<thead>
<tr>
<th>Area</th>
<th>Exercise</th>
<th>Rep</th>
<th>Sets, intensity, etc.</th>
<th>Rep</th>
<th>Sets, intensity, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up/</td>
<td>Treadmill/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardio</td>
<td>walking outside</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitball</td>
<td>Circles/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>leg extension</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Fitball</td>
<td>Ball rollout</td>
<td></td>
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<tr>
<td>Wall</td>
<td>Wall squats (bum back)</td>
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<td>knees behind toes</td>
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<tr>
<td>Fitball/</td>
<td>Back ext.</td>
<td></td>
<td>curl upper and lower</td>
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</tr>
<tr>
<td>ground</td>
<td>back</td>
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</tr>
<tr>
<td>Fitball/</td>
<td>Bridging</td>
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<td>3-sec hold</td>
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</tr>
<tr>
<td>chair</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>band</td>
<td>Bicep curl</td>
<td></td>
<td>slow back down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Ab crunch</td>
<td></td>
<td>chin down to protect</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>neck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>band</td>
<td>Side leg raise</td>
<td></td>
<td>UB straight</td>
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</tr>
<tr>
<td>band</td>
<td>Two-arm row</td>
<td></td>
<td>relax shoulders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stair</td>
<td>Calf raises (back straight)</td>
<td></td>
<td>can also do one leg @</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a time</td>
<td></td>
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</tr>
<tr>
<td>band</td>
<td>Tricep extension</td>
<td></td>
<td>stretch top arm</td>
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</tr>
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<td></td>
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<td>back after</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Band</td>
<td>Chest fly</td>
<td></td>
<td>arms straight out</td>
<td></td>
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</tr>
<tr>
<td>Floor</td>
<td>Heel taps</td>
<td></td>
<td>abs in, lower back</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>flat</td>
<td></td>
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</tbody>
</table>

**COOL DOWN**

**COOL DOWN**
APPENDIX E

Figures for 20-Week Changes
Figure 15. Changes from baseline to 20-week assessment in cardiorespiratory endurance in each group (C, Ex, ExC, and UsC), as assessed by $\dot{V}O_{2\text{max}}$ values (mL·kg$^{-1}$·min$^{-1}$) obtained utilising the Modified Bruce treadmill protocol.

Figure 16. Changes from baseline to 20-week assessment in upper-body strength in each group (C, Ex, ExC, and UsC), as assessed by number of repetitions performed of YMCA bench press.
Figure 17. Changes from baseline to 20-week assessment in lower-body strength in each group (C, Ex, ExC, and UsC), as assessed by a 1-RM leg press.

Figure 18. Changes from baseline to 20-week assessment in flexibility in each group (C, Ex, ExC, and UsC), as assessed by the Sit-and-Reach.
Figure 19. Changes from baseline to 20-week assessment in emotional self-efficacy in each group (C, Ex, ExC, and UsC), as assessed by the Stanford Emotional Self-Efficacy Scale-Cancer (SESES-C).