A PILOT FEASIBILITY STUDY OF AN ONLINE LIFESTYLE GROUP INTERVENTION FOR BREAST CANCER SURVIVORS: THE HEALTHY LIFESTYLE MODIFICATION AFTER BREAST CANCER (HLM-ABC) PROGRAM

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Abstract

Overweight is a common concern for many breast cancer survivors (BCSs), which coincides with serious comorbidities and/or health risks, including diminished quality of life, poorer cancer prognosis and/or increased mortality. Most weight-loss interventions for this population seek to modify either physical activity and/or diet with a focus on weight loss as the primary objective. Such approaches, however, often overlook the importance of psychological well-being as an inextricable part of women's health and overall functioning. This study sought to develop and evaluate a novel group-based lifestyle intervention (Healthy Lifestyle Modification after Breast Cancer; HLM-ABC) to help BCSs make healthy lifestyle changes that extend beyond physical outcomes to include greater behavioural, emotional, and mental well-being. The feasibility, acceptability, and preliminary effectiveness of this intervention was assessed using a single-arm, mixed-method design. Fourteen women participated in the 10-week online intervention and completed various quantitative measures (weight, body mass index, waist circumference, self-efficacy, motivation, intuitive eating habits, physical activity level, quality of life, psychological distress, body image) at baseline, post-treatment, six-month, and 12-month follow-ups. Qualitative data was also obtained at post-treatment via semi-structured interviews and open-ended responses on a treatment satisfaction questionnaire. Given the exploratory nature of this pilot study, the findings were triangulated to generate a comprehensive understanding of participants' experience of the HLM-ABC program and its preliminary impact. Results suggest that this intervention is feasible to implement and satisfactory to the recipients. Furthermore, the program demonstrates promise with respect to the potential to help BCSs manage their weight, develop greater intuitive eating practices, move their bodies more and in increasingly satisfying ways, inspire positive shifts in motivation and attitudes toward health behaviour change, and improve their body image.

Implications for fostering optimal interpersonal conditions in online psychoeducational groups are discussed, along with the value of incorporating deliberate strategies into health behaviour change interventions that appeal to individuals' universal and basic motivations to feel self-governed, efficacious, and connected with others. Finally, a rationale is offered for more widespread adoption of a broad definition of health that emphasizes not only a person's bodily measurements, but also their behaviour, psychosocial well-being, and (often unmodifiable or uncontrollable) context.

DEDICATION

"The good life is a process, not a state of being. It is a direction, not a destination."

-Carl Rogers

I dedicate this dissertation to the women affected by breast cancer. To those of you who I have had the pleasure of working with and those of you who I have yet to meet, your fortitude and resilience inspire me. Your quests for greater purpose, meaning, and integrity are heartening and a privilege to witness and accompany you on.

I especially dedicate this dissertation to the women who volunteered to participate in this study, out of a palpable dedication to their health and that of their fellow survivors through advancement of research.

Finally, I dedicate this dissertation to all women, as not one of us is immune to the tensions of self-acceptance and self-actualization.

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The present dissertation is a pilot feasibility study of a program development and evaluation project titled "The Healthy Lifestyle Modification after Breast Cancer" (HLM-ABC) intervention. Chapter I entails a rationale for the current study, including the importance of weight management during BC survivorship and the utility of virtual services geared to this population. Chapter II encompasses a comprehensive review of the relevant literature regarding lifestyle considerations during BC survivorship (i.e., weight management, physical activity, eating habits, mental well-being) and theoretical foundations of the HLM-ABC program. Chapter III outlines the study methods, including research aims and questions, study design, procedures, and measures. Chapter IV presents the study results, which are organized according the three broad research questions: 1) is the program feasible to implement, 2) is the program acceptable to the recipients, and 3) does the program demonstrate limited effectiveness, based on preliminary evidence of impact on a number of target variables? Finally, Chapter V involves a discussion of the results, relates key findings to the broader relevant literature, highlights the study's clinical and empirical implications, acknowledges the current study's limitations, and offers a summarizing conclusion.

CHAPTER I: Introduction

Breast cancer (BC) is the most common form of female cancer worldwide, with an estimated 2.09 million cases in 2018 (World Cancer Research Fund Report, 2014); World Health Organization [WHO], 2018). It is the second leading cause of death from cancer in Canadian women. In 2019, an estimated 27,200 women were diagnosed with BC (an average of 75 women every day), representing 25% of all new cancer cases (Canadian Cancer Statistics Advisory Committee [CCSAC], 2019).

The progression of cancer occurs as a result of the interplay between a person's genetics and environmental factors, such as physical carcinogens (e.g., ultraviolet, radiation), chemical carcinogens (e.g., asbestos, tobacco, arsenic), and biological carcinogens (e.g., infections) (Boyd, Martin & Minkin, 2010; WHO, 2018). Age is another key factor in the development of cancer, with the incidence rising dramatically with age and cumulative build-up of exposure to these risk factors (WHO, 2018). The risk of BC is higher for women in developed countries and post-menopausal women between the ages of 50-69 years compared to younger, pre-menopausal women. The Canadian Cancer Society (CCS, 2015) lists several risk factors for developing BC, including family history of breast and other cancers, genetic conditions (e.g., Li-Fraumeni syndrome, Cowden syndrome) and mutations (e.g., BRCA1, BRCA2, PALB2, CHEK2), breast density, early menarche, late menopause, Ashkenazi Jewish ancestry, hormone replacement therapy, physical inactivity, and obesity.

Given advances in early detection, more than 80% of female breast cancer survivors (BCSs) in 2017 were diagnosed as early stage (stage I or II), with less than 5% diagnosed at stage IV (CCSAC, 2018). Relatedly, between 1986 and 2019, the mortality rate for breast cancer decreased dramatically by approximately 48% (CCSAC, 2019). The overall five-year net survival for BC is 87%, varying from 22% for stage IV to nearly 100% for stage I (CCSAC, 2018). In light of increased survival rates, there remain numerous long-term challenges for women following BC treatment. BC treatment side effects include lymphedema, nausea, insomnia, fatigue, pain and weight gain (Mols, Vingerhoets, Coebergh, & Van de Poll-Franse, 2005; Shapiro & Recht, 2001). Psychosocial challenges for survivors are commonly reported as mild to moderate depression, anxiety, fatigue, poor body image, decline in cognitive functioning, sexual difficulties, poorer quality of life (QoL), and existential concerns (Gans et al., 2013; Mols,

Vingerhoets, Coebergh, & Van de Poll-Franse, 2005). Among the most prevalent, yet less commonly discussed, survivorship concerns is substantial weight gain, with more than 50% of women being overweight at diagnosis and additional (50-96%) weight gain often resulting from treatment (Cantarero-Villanueva et al., 2015; Reeves, Terranova, Eakin, & Demark-Wahnefried, 2014; Rock et al., 2013).

Excess weight and body fat distribution (i.e., body size and shape) are important modifiable risk factors for BC survivors, given their association with other health conditions (e.g., type II diabetes, heart disease, stroke, hypertension, obstructive sleep apnea), as well as increased risk for cancer recurrence and mortality (Cleary & Grossmann, 2009; Ligibel & Strickler, 2013; Ligibel, 2011; Protani, Coory, & Martin, 2010). In the case of BC specifically, increased fat results in greater production of estrogen, insulin, leptin and pro-inflammatory cytokines, and lesser production of sex hormone binding globulin, all of which have been linked to the promotion of BC and tumor growth (Rock et al., 2013). In addition to increasing the risk for medical illnesses, being overweight is associated with a range of psychological difficulties including mood disorders, eating disorders, chronic pain, sleep disturbances, and reduced quality of life (QoL) (Collins, Meng, & Eng, 2016). Psychological issues can underlie the development of unhealthy behaviours and excess weight; they can also occur as a result of ongoing weight struggles. For these reasons, interventions aimed at achieving and maintaining a healthy body weight should also aim to support healthy mental and emotional functioning.

Weight Management Programs for BC Survivors

Research evidence demonstrates that diet and exercise interventions can lead to improvements in physical and mental health (Bekkering et al., 2006), however, there remains a lack of consistent evidence that these gains are maintained over time — even as few as six

months post-intervention (Campbell et al., 2012; Greenlee et al., 2012; Pierce et al., 2007; Pinto & Maruyama, 1999; Thomson et al., 2005). Studies investigating the benefits of moderate-to-vigorous physical activity (MVPA) following diagnosis of BC reveal that such benefits seem to only be maintained only for as long as exercise behaviours continue (Ritvo, Obadia, Mina, et al., 2017) . Therefore, the maintenance of healthy behaviours over time following active completion of such interventions is paramount. Sustained MVPA following participation in interventions aimed at enhancing physical activity (PA) has not been well studied in cancer survivors (Ritvo et al., 2017). A systematic review of 63 physical and/or dietary intervention studies for BC populations (Spark, Reeves, Fjeldsoe, & Eakin, 2013) found that only 10 of them collected post-intervention data regarding maintenance of behavioural outcomes (Spark et al., 2013). Of those studies that did collect follow-up data, 4 of 10 reported successful maintenance of targeted behaviour when assessed at 3-months post-intervention (Spark et al., 2013). One study, conducted with 488 cancer survivors residing in the United States, Canada, or United Kingdom, randomized participants to a wait-list control condition or to a combined diet and PA intervention. The intervention comprised mailing participants print material and conducting 15 individual telephone counseling sessions over a one-year period (Demark-Wahnefried et al., 2012). Weekly PA levels were found to have increased significantly from baseline to one-year post-intervention for those assigned to the intervention group, and these gains persisted at the 2-year time point (i.e., one year follow-up) (Demark-Wahnefried et al., 2012). These findings are encouraging, but are based on self- report data alone, and future research should aim to collect objective data (e.g., PA monitors, systematically/professionally measured weight, waist circumference) in addition to self-report outcomes. In summary, longitudinal assessments of PA maintenance in BCSs vary greatly in terms of the length of time between completion of

intervention and follow-up measurement, and are lacking in use of objective outcome data (Short, James, Stacey, & Plotnikoff, 2013; Spark et al., 2013).

Arguably, programs that focus primarily on modifying nutrition and/or PA render limited or temporary effects because they fail to address other more subtle but ingrained psychological factors (i.e., mood, preferences, motivation) that can interfere with sustained progress. Furthermore, despite evidence that indicates tailoring PA programs to the unique preferences and needs of participants can enhance program engagement and maintenance of gains, the majority of randomized controlled trials (RCTs) of such interventions have been based on *prescription* of PA, and have not taken into account the individuality of BCSs themselves (Mills, Stewart, Sepsis, & King, 1997; Thompson & Wankel, 1980; Whitehead & Lavelle, 2009). There is evidence to suggest that interventions that account for these contextual factors and include self-directed professionally-guided PA, follow-up behavioural prompts, and at least four sessions of related counseling are associated with successful promotion of PA (Ritvo et al., 2017). While exercise and dietary prescriptions provide helpful evidence-based guidelines and risk-reduction goals, it has been recommended that promotion of PA should involve a psychological component that fosters incremental behavioural change and reinforcement of sustained effort toward longer-term goals through immediate gratification and accumulative experiences of accomplishment (Ritvo et al., 2017). Overall, overweightness and obesity are recognized as chronic conditions that require management over time and as a behaviour occurring in relation to an individual's unique thoughts, feelings, and interactions with their environment (AMA; Campbell-Scherer & Sharma, 2016).

The Need for Online Lifestyle Interventions for BC Survivors

As of the most recent Canadian Internet User Survey, 93.6% of Canadians aged 15 years

and over have access to the Internet at home (Statistics Canada, 2020). With growing use, online technology has a rapidly increasing role within healthcare, both in terms of how clinicians and patients access knowledge and how they deliver and access services, respectively. Society's recent movement toward "eHealth," referring to "the use of emerging information and communication technology, especially the Internet, to improve or enable health and health care" (Eng, 2001), introduces an exciting opportunity to increase availability and accessibility of health care to BC survivors. In support of health behaviour change in particular, the Internet can provide timely prompts and reminders, reinforcement, assessment, feedback, and means of behaviour-tracking (Ritvo et al., 2017). Supportive and dynamic communications can occur between users and providers during critical moments when doing so may have greater impact than delayed in-person opportunities for the same. Despite the accumulating evidence of improved health outcomes with online technologies in PA promotion (van den Berg, Schoones, & Vlieland, 2007), these technologies have been understudied in cancer populations (Ritvo et al., 2017).

Given the broad and varying impacts of cancer treatment on patients' functioning (i.e., mobility, energy levels, pain, ability to work and earn an income), BC survivors represent a population that could especially benefit from the convenience and accessibility of online services. Rural BC survivors represent a subgroup with limited access to healthy lifestyle interventions, and who could benefit greatly from participation. Compared to their urban counterparts, these women are less likely to have timely diagnostic biopsies and receive optimal treatment, and are diagnosed later, at more advanced stages when prognosis is less favourable (Befort, Austin, & Klemp, 2011). They are also more likely to be obese, be less physically active, have poor eating habits, experience psychological distress, and have less access to mental

health resources, placing them at heightened risk for weight gain (Befort et al., 2011; Elfhag & Rossner, 2005; Hauenstein et al., 2006). Researchers and health care providers have a responsibility to develop ways of redressing such health disparities and helping these particularly vulnerable women make lasting changes to their overall health and QoL. As such, there is reason to invest in the development and implementation of online cancer care, given the ease of access, convenience, and relative anonymity of such services.

Interventions aimed at supporting health behaviour change (i.e., most commonly investigated as "weight loss interventions") have been demonstrated efficacy when delivered in group format. A recent meta-analysis of 47 randomized controlled trials of group-based weight loss interventions concluded that "diet and physical activity interventions delivered in groups are effective in promoting clinically meaningful weight loss at 12 months" (Borek, Abraham, Greaves, & Tarrant, 2018, p. 62). The specific interventions investigated varied considerably in contact time, group size, facilitator background, material delivered, and setting; however, those that explicitly targeted weight loss (as opposed to other primary outcomes) and included feedback to participants were found to be most effective (Borek et al., 2018). Another systematic literature review (Khasteganan & Tsiami, 2011) found that group-based weight loss programs led to greater weight loss outcomes than did self-help interventions.

Albeit limited, research on the effects of group-based lifestyle interventions for BCSs is encouraging. One such trial of a 12-week group-based program offering diet and exercise educational group sessions resulted in significant reductions in body weight and percentage body fat from pre- to post-intervention (Travier et al., 2018). Another feasibility study evaluated the efficacy of a 24-week group lifestyle program amongst a sample of 14 early-stage BCSs (Campbell et al., 2012). Results revealed clinically meaningful reductions in weight (3.6-5 kg),

BMI, percentage body fat, and waist circumference, with additional weight loss (0.8-1.2 kg) at 12-weeks follow-up. Of note, both of these studies were single-arm trials without a control group. Qualitative feedback about this same program revealed that participants valued the group format amidst other BCSs, and the safe and supportive environment fostered by program leaders (Balneaves et al., 2014). A 2006 pilot study randomized 60 BCSs to either a lifestyle intervention or standard care as usual, and reported preliminary effects of significantly better performance on a 6-minute walk task, greater motivational readiness for PA, improved pain, and overall general health for the intervention group (Basen-Engquist et al., 2006). The investigators did not find any significant difference between the two groups in terms of the number of minutes or days spent on moderate-to-intense PA. Another single-arm pilot study without a control group conducted a pre-post analysis of 48 women with breast cancer who participated in 24 classes on exercise training and dietary and health behavior (Casla et al., 2014). Participants were found to have increased their PA levels, global strength, functional capacity, and QoL, and decreased their depression scores.

Despite growing evidence for the efficacy of interactive Internet-based programs aimed at behaviour change (Norman et al., 2007) and the associated advantages, a systematic search of relevant literature databases (MedLine, PsycINFO, and CINAHL) revealed that there are very few published studies of online, interactive group-based interventions to support weight loss and sustained management for BC survivors. PsycINFO is a database that indexes journal articles, dissertations, reports, books, book chapters, and other academic documents from over 45 countries in more than 30 languages, dating back from 1872. Medline is a database that provides access to international scholarly documents in over 40 languages, dating back to 1946, in fields of biomedicine and health. The majority of its publications are journals articles, and a small

proportion is newspapers, magazines, and newsletters. CINAHL provides access to journals, books, pamphlets, dissertations, and audiovisual information dating back to 1937, from a range of healthcare professions, including 50 nursing specialties, speech and language pathology, nutrition, general health and medicine.

A literature search was conducted on December 20, 2018 using the following search terms with all three databases: “breast cancer” AND “online” OR “internet” OR “web” OR “smart phone” OR “mobile” AND “weight loss” OR “lifestyle” OR “exercise” OR “physical activity” AND “program” OR “intervention” or “group” OR “implement” OR “deliver.” The search terms were not limited to any particular search field, and there was no restriction on date range or type of document. The searches from PsycINFO, Medline and CINAHL yielded 79, 77, and 85 results, respectively, and after removing duplicates, a total of 181 unique publications. These were thoroughly reviewed to identify studies of online interventions for women with BC aimed at improving physical well-being.

Of the 181 total results, only four publications involved web-based lifestyle interventions for BC survivors (Galiano et al., 2013; Hatchett, 2009; Kay, 2014; Lee et al., 2014). Of these, three programs targeted only exercise, and not eating habits (Galiano et al., 2013; Hatchett, 2009; Kay, 2014). The fourth publication details a feasibility study of a 12-week online self-management diet and exercise program grounded in the transtheoretical model of change (Lee et al., 2014). However, this intervention was non-interactive, in that it provided participants with automated feedback in response to their progress tracking. Furthermore, this study lacked follow-up data to evaluate the sustainability of outcomes. Of note, none of the four existing online lifestyle interventions for BC survivors was designed to be delivered in a group format.

Another proposed study (results of which have yet to be published) is currently being

conducted with BCSs that involves smartphone-enabled health coaching (referred to as the iMove intervention) to promote long-term maintenance of PA in this population (Ritvo, Obadia, Santa Mina, et al., 2017); however, only the one-on-one coaching is provided through use of mobile technology, while the group-based component of this intervention takes place in-person.

On May 13, 2020, the author conducted an updated literature search using the same three databases and search terms, and limited the results to dates between December 21, 2018 and present. This search revealed that in the 17 months between search queries, there were 20 new results via PsycINFO, 33 via Medline, and 29 via CINAHL. After inspecting the results and eliminating duplicates and publications that did not meet the relevant criteria (e.g., were not intervention studies, were implemented in-person, were delivered to a sample other than BCSs), a total of 10 relevant articles remained.

Of these 10 studies of online lifestyle interventions for BCSs, six targeted PA but not eating habits (Ariza-Garcia et al., 2019; Chung et al., 2020; Dong et al., 2019; Nápoles et al., 2019; Pope, Lee, Zeng, Lee, & Gao, 2019; Rutsch et al., 2020). Two studies targeted eating and PA, one of which was a pre-post design of an 8-week mobile program that monitored individual participants' energy intake and expenditure and provided automated feedback reminders, and recommendations (Lozano-Lozano et al., 2019). This study did not collect follow-up data. The other PA and diet intervention involved a smartphone application that delivered educational information and was used to monitor exercise and diet (Park, Lee, & Kim, 2019). This intervention also involved an element of peer support in the form of spontaneous (i.e., not professionally facilitated or directed) sharing of successes and strategies, and included follow-up at 3 months post-intervention.

The final two studies took a holistic lifestyle approach that included PA, diet, and

psychological interventions (Holtdirk, Mehnert, Weiss, Meyer, & Watzl, 2020; Yun et al., 2020). The first of these was a three-arm randomized controlled trial involving a control group, a web-program-only group, and a web-program plus health coaching component (Yun et al., 2020). Unlike the present HLM-ABC study, this program was developed for individuals diagnosed with various kinds of cancer (stomach, colon, lung, and breast) who recently (within two months) completed active treatment, and the study design lacked follow-up data. The second publication detailed a protocol for a proposed RCT of an online lifestyle program that intends to incorporate cognitive-behavioural therapy and mindfulness-based techniques along with dietary and PA recommendations. Both of these holistic online programs were intended for individual use (i.e., not delivered in a group format). To the author's knowledge, no exclusively online, professionally-facilitated, interactive group-based lifestyle intervention has yet been developed for BC survivors.

Given the potential for broader delivery of health care services via the Internet and the benefits of group-formatted programs, research surrounding the value of group-based online lifestyle interventions is especially warranted. Investigation of the effects of group-based lifestyle interventions for BCSs is in its early stages. While the available findings are promising, there is a lack of long-term follow-up data evaluating the sustained effectiveness of such programs, particularly those delivered in group formats. This study aimed to address this gap by developing and evaluating the first online, interactive group lifestyle intervention for BCSs.

CHAPTER II: Literature Review

Lifestyle Considerations During BC Survivorship

Weight gain. Obesity is defined as weight that is above what is considered healthy for a given height. Body mass index (BMI) is one common form of measuring relative health

according to weight. On average, more than half of BCSs are obese at the time of diagnosis, and an estimated 50-96% gain weight during treatment, with the most common weight gain being between 2.5 to 6.0 kilograms (Campbell, Lane, Martin, Gelmon, & McKenzie, 2007; Cantarero-Villanueva et al., 2015; Demark-Wahnefried, Campbell, & Hayes, 2012). Possible explanations for treatment-related weight gain are a combination of type and length of chemotherapy, increased fatigue, reduced PA and resting energy expenditure, increase in energy intake, and development of amenorrhea and/or menopause (Campbell et al., 2007).

Obesity has serious prognostic implications for both pre- and post-menopausal breast cancer survivors (BCSs) as it is associated with increased risk for cancer recurrence and mortality (Cleary & Grossmann, 2009; Ligibel & Strickler, 2013; Ligibel, 2011; Protani, Coory, & Martin, 2010). Increased fat results in greater production of estrogen, insulin, leptin and pro-inflammatory cytokines, and lesser production of sex hormone binding globulin, all of which have been linked to the promotion of BC and tumor growth (Rock et al., 2013). Studies indicate that women who have never taken hormone replacement therapy and who have a BMI of 31.1 or higher have a 2.5 times greater chance of developing BC than those with a BMI of 22.6 or lower (Canadian Cancer Society [CCS], 2020). Cancer patients with a BMI greater than 35 have also been found to have worse disease-free survival than those of normal weight, regardless of age, race, treatment, and sex (Cantarero-Villanueva et al., 2015; Sinicrope, Foster, Sargent, O'Connell, & Rankin, 2010). Obesity especially increases the risk of BC in post-menopausal women. Female hormones (estrogens in particular) are strongly linked to the development of BC; the higher the level of estrogen the breast tissue is exposed to over time, the greater the risk (CCS, 2020). Following menopause, the ovaries no longer produce the same levels of estrogen; however, fat tissue produces a small amount of estrogen. Thus, the greater fat tissue a woman

has (either because of premorbid obesity or as a result of weight gain), the more estrogen her body continues to produce and the greater her risk of developing BC (Morimoto et al., 2002). Chemotherapy treatment also plays a significant role in post-diagnosis weight gain by causing damage to the ovaries and subsequent onset of menopause, which has a direct slowing effect on metabolism (Demark-Wahnefried et al., 2012). Despite this knowledge, the exact pathophysiological mechanisms of the relationship between BMI and BC survival remains unclear (Demark-Wahnefried et al., 2012).

Physical activity. Along with obesity, lack of PA is considered to be one of the most important health determinants in BCSs who have completed adjuvant treatment (Sinicrope et al., 2010). A high BMI and sedentary lifestyle are related to decreased fitness, which are related to health conditions including cardiovascular disease, alterations in body composition (i.e., increased waist circumference), and cancer-related fatigue (Cantarero-Villanueva et al., 2015). These conditions, in turn, contribute to increased BMI and sedentariness, creating a vicious cycle.

BCSs suffer severe side effects during and following treatment that can directly limit their mobility and engagement in PA. Furthermore, changes in strength and overall fitness as a result of increased sedentariness (i.e., decreased grip strength, reduced cardiovascular strength) can also affect BCSs' activity levels. Engagement in PA tends to decrease during BC treatment, and can remain low for years beyond treatment (Schmidt, Wiskemann, Ulrich, Schneeweiss, & Steindorf, 2017; Whitehead & Lavelle, 2009). This is particularly true for moderate and vigorous activity levels among obese women (Irwin et al., 2003; Irwin et al., 2004). One sample of 558 Australian BCSs who had recently completed adjuvant therapy determined that only 31% of women met recommended PA guidelines post-treatment. Studies that have followed BC patients

over time following treatment have found that many (32-42%) were no longer physically active or were minimally active but did not meet recommended exercise guidelines, at 6, 12, and 18 months follow-up time points (Courneya et al., 2008; Mutrie et al., 2012; Schmidt et al., 2017). This finding was true for women who participated in exercise interventions during or after treatment as well as for those who were assigned to treatment-as-usual control groups.

Factors that have been associated with decreased levels of sustained PA among BCSs include low levels of exercise pre-diagnosis, low education, post-menopausal status, physical and psychological difficulties, and a gradual return to baseline lifestyle habits following a phase of acute focus on one's health during and immediately following cancer treatment and as part of active recovery (Pudkasam et al., 2018). Low confidence in the long-term benefits of exercise represents another potential factor in low levels of PA amongst BCSs (Hirschey, Docherty, Pan, & Lipkus, 2017; Pudkasam et al., 2018). For older BCSs, additional health issues can be a common obstacle to PA, while fatigue, family responsibilities, physical ailments, transportation factors, employment obligations and financial limitations, and negative attitudes toward exercise represent especially compounding barriers among minority BCSs (Aycinena et al., 2017).

Not all BCSs reduce their engagement in PA following treatment. Those who are physically active prior to diagnosis tend to remain active following diagnosis, with there being a moderate positive correlation between pre- and post-diagnosis PA levels (Spearman correlation coefficient of $r = 0.50$) (Schmid & Leitzmann, 2014; Schmidt et al., 2013). Furthermore, some cancer patients are motivated to be more physically active and adopt a healthier lifestyle after treatment, and it has been found that those who increase their PA levels from pre- to post-diagnosis reduce their risk of mortality (Schmid & Leitzmann, 2014).

Regardless of pre-morbid health status, research consistently demonstrates the

importance of PA during BC survivorship. The health benefits of PA appear to be true for BCSs regardless of tumor stage, cancer treatment, smoking habits, menopausal status, body composition, and weight and have been demonstrated in large and small sample-sizes alike, across various cultures (Schmid & Leitzmann, 2014). The CCS and American Cancer Society (ACS) have published PA guidelines of 30 minutes per day of moderate to vigorous daily activity (CCS, 2020) or 150 minutes of moderate (or 75 minutes of vigorous) activity per week (ACS, 2017). Meta-analyses support these recommendations, as approximately 150 minutes of MVPA per week following diagnosis has been associated with a 24% reduced risk of mortality (Schmid & Leitzmann, 2014).

The protective effects of PA may be explained by a number of underlying biological mechanisms. Studies with BCSs have demonstrated that PA leads to physiological changes that likely mediate the relationship between this behaviour and increased risk of recurrence and/or mortality (Schmid & Leitzmann, 2014). In particular, exercise has been found to lower C-reactive protein in the blood (a marker of inflammation) and blood pressure, facilitate metabolic processes and weight loss, decrease insulin levels and insulin-like growth factors, reduce adipocytokines, regulate inflammation and improve immune function (Friedenreich & Cust, 2008; Schmid & Leitzmann, 2014). In addition, PA reduces levels of estrogen in healthy postmenopausal women (Friedenreich & Cust, 2008). This may explain the especially pronounced inverse relationship between PA and BC mortality in post-menopausal women.

In summary, there is strong evidence for engagement in PA before and/or after cancer diagnosis, as well as increased PA from pre- to post-diagnosis, is associated with statistically significant decreased risks of total and cancer mortality among BCSs (Schmid & Leitzmann, 2014). These findings emphasize the importance of engagement in PA during survivorship.

Eating patterns. Dietary cancer guidelines have been developed based on metabolic disease literature, which generally recommend an intake of low-fat foods, whole grains, fruits and vegetable carbohydrates (Champ, Voleck, Siglin, Jin & Simone, 2012). In general, a varied diet comprised of five servings of fruits and vegetables and less than two alcoholic beverages (e.g., a glass of wine) per day and limited saturated fats is also recommended (Gandini, Merzenich, Robertson, & Boyle, 2000; Hamer & Warner, 2017; Magné et al., 2011). Supported weight control strategies include reduction of calorie- or energy-dense foods and consumption of low-energy dense foods (e.g., water, fruits and vegetables rich in fiber), limited intake of foods and beverages high in fat and added sugar, and controlled portion sizes of energy-dense foods (Rock et al., 2012).

Foods rich in omega-3 fatty acids (e.g., fish, flaxseed) have been recommended for their known association with reduced risks of cardiovascular disease and overall mortality (Rock et al., 2012). Adequate protein intake is also considered to be essential during all stages of illness, including during treatment, recovery, survival, and while living with advanced disease. The best protein options are considered to be those low in saturated fat (e.g., fish, lean meat, skinless poultry, eggs, non-fat and low-fat dairy products, nuts, seeds, and legumes) (Rock et al., 2012). For some time, there was concern about the consumption of soy products as they were believed to be associated with development of cancer; however, the recent evidence indicates that there is no relationship between the phyto-estrogens contained in soy and the development of BC, and this notion has been disconfirmed (Hamer & Warner, 2017). Plant-based diets low in fat, and high in whole grains, fruits, and vegetables have also been recommended for BCSs (BC Cancer Agency 2012; Hauner et al. 2011; Magné et al., 2011). In addition, the importance of adequate calcium and vitamin D intake has been emphasized to support bone health, especially

considering the natural or treatment-induced menopausal status of so many BCSs (Canadian Breast Cancer Foundation 2012; Vance, Campbell, Mccargar, Mourtzakis, & Hanning, 2014).

An American study found that BCSs with eating patterns high in vegetables, fruits, whole grains, poultry, and fish had lower mortality rates than did those with eating habits characterized by high intake of refined grains, processed and red meats, desserts, high-fat dairy products, and French fries (Kroenke, Fung, Hu, & Holmes, 2005). Another study found an association between a "prudent" dietary pattern (i.e., characterized by high intakes of fruits, vegetables, whole grains, and poultry) and a 43% reduction in overall (i.e., non-cancer related) mortality amongst their sample of BCSs (Kwan et al., 2009).

Research conducted in Germany found that BCSs with higher patterns of 'unhealthy' eating (i.e., high intake of red meat, processed meat, deep-fried fat) pre-diagnosis were at heightened risk of non-breast cancer mortality, whereas those with 'healthy' habits (i.e., high intake of vegetables, fruits, vegetable oil, sauces/condiments, soups/bouillons) were at decreased risk of overall mortality and, for stage I–IIIa patients only, at decreased risk of BC recurrence (Vrieling et al., 2013). Furthermore, BCSs who reported eating at least 5 servings of vegetables and fruits each day and engaging in PA equivalent to 30 minutes of walking for six days per week were found to have higher survival rates (Pierce et al., 2007). Interestingly, this increased survival effect was not significant for either of these behaviours independent of the other, suggesting that it is the combined effects of a healthy lifestyle (i.e., PA and eating habits) that are associated with positive health outcomes.

The Women's Intervention Nutrition Study, which consisted of a randomized controlled trial of more than 2,400 postmenopausal BCSs, found that women who were randomized to the five-year dietary intervention to reduce their dietary fat intake by 15% lowered their incidence of

recurrence significantly, compared to those in the control group (Chlebowski et al., 2006). In contrast, the Women's Health Initiative's Dietary Modification Trial found that postmenopausal BCSs who consumed healthier diets (as measured by the Healthy Eating Index-2005) did not have a reduced risk of BC mortality (George et al., 2014). One meta-analysis that systematically reviewed prospective studies of the effects of weight management, healthy diet, moderate alcohol consumption, and fruit and vegetable intake on BC risk concluded that while low-fat diets and reduced alcohol intake are reliably associated with reduced risk of BC, increased intake of fruit and vegetables is not (Cummings et al., 2009).

Trials of dietary interventions that have aimed to increase BCSs' consumption of fruits, vegetables, and fiber, and reduce intake of fat have generally been effective in achieving short-term goals, including weight loss during the first six months of trial (Pierce et al., 2004; Uhley, & Jen, 2007). However, the long-term effectiveness of these interventions is questionable (Uhley & Jen, 2007). For instance, one notable study conducted by Thomson and colleagues (2005) with 77 BCSs found that after four years, participants' body weight, BMI, and body composition were not significantly different from their baseline levels.

While the literature consistently reveals that increased PA is strongly associated with better BC outcomes, the research on diet and BC outcomes is less conclusive (Chlebowski, 2013; Champ, Volek, Siglin, Jin & Simone, 2012; Cummings et al., 2009; Magné et al., 2011). Food consumption is a complex behaviour that is very difficult to measure reliably through use of questionnaires (especially those that are self-reported) and thus subject to recall biases. Furthermore, interactions may occur between different nutrients absorbed, or between foods consumed and personal variables like fat and muscle mass, hormone levels, and use of medications, drugs, or alcohol (Cummings et al., 2009). These complicating factors may in part

explain the inconsistent findings regarding the effects of different diets amongst BCSs.

Despite the lack of consensus regarding a particular diet or combination of food intake to reduce the risk of BC recurrence or mortality (Hamer & Warner, 2017), dietary guidelines have been recommended for BCSs nonetheless, based on supporting studies and the rationale that such lifestyle changes are safe and at the very least have not been associated with worse outcomes. Furthermore, healthy eating habits can be reasonably expected to mediate or facilitate weight reduction/management, which itself has been reliably linked with lowered risk of BC recurrence or mortality (Cummings et al., 2009). Finally, the research consistently demonstrates that a healthy diet is positively correlated with primary prevention of other (i.e., non-cancerous) chronic medical conditions, such as cardiac disease, which may indirectly decrease the risk of developing BC (Vrieling et al., 2013).

In summary, the evidence is inconclusive regarding the relationship between specific eating patterns, BC mortality and recurrence. However, the link between obesity and poorer BC prognosis is well-documented, and eating habits represent an important modifiable part of a woman's overall lifestyle that can contribute to healthy weight management. Furthermore, studies consistently reveal a negative correlation between healthy eating patterns and non-cancer related mortality, which lends support for the adoption of more prudent lifestyle behaviours, including eating habits, that can improve longevity and overall health (Kroenke et al., 2005).

Mental well-being. BC patients are impacted by a host of distressing factors that begin at time of diagnosis, are compounded during active treatment, and extend well into survivorship (e.g., pain, fear of death, hormonal changes, body alteration and loss of body integrity, changes in sexuality and sexual dysfunction, loss of fertility, body image disturbance, altered or lost employment, relationship conflict, fear of recurrence) (Pudkasam et al., 2018; Reich, Lesur, &

Perdrizet-Chevallier, 2008). These experiences are related to significant psychological distress and coincide with depression, anxiety, low self-esteem, poor social support, reduced quality of life (QoL) and feelings of anger (Reich et al., 2008).

Depression, anxiety, and quality of life. Being overweight further compounds the negative effects of BC on mental health, as it has been strongly linked to the presence of mood disorders, anxiety, and poorer body image and quality of life (QoL) in the general population (Collins et al., 2016). The relationship between mental health and weight is thought to be bi-directional. Obese individuals have a 30% higher risk of developing a mental health issue, and individuals with mental health issues are 2-3 times more likely to be obese (Cassin, 2017). Individuals in the general population diagnosed with a major mental illness have been found to be at a 38% increased risk of mortality due to an obesity-related illness (Cassin, 2017). The association between obesity and QOL was confirmed by researchers who conducted a long-term study of an ethnically diverse population of BCSs and population-based controls in New Mexico (Connor, Baumgartner, Pinkston, Boone, & Baumgartner, 2016). This study found that, among BCSs but not controls, higher BMI at "baseline" (reported as a median time of 193 days after diagnosis) was associated with poorer mental health.

The prevalence of depression amongst BCSs is estimated to be approximately 53%, with rates of about 20-30% in women with early-stage cancers and higher rates (i.e., > 50%) amongst those with advanced-stage cancers (Reich et al., 2008). The prevalence of depression, anxiety, or both, has been found to be twice as high among BCSs in the first year following diagnosis than in the general female population (Burgess et al., 2005; Reich et al., 2008; Zabora, BrintzenhofeSzoc, Curbow, Hooker, & Piantadosi, 2001). One study found that the prevalence of depression, anxiety, or both in their sample of 170 women with BC was 33% at the time of

diagnosis, 50% in the first year following diagnosis, 25% in the second, third, and fourth years, and 15% in the fifth year (Burgess et al., 2005). One nation-wide study of 87,843 South Korean BCSs found that over 30% had experienced significant mental distress (particularly depression and anxiety) approximately one year prior to diagnosis, implying that a substantial subgroup of women are at increased risk for the development of psychological difficulties during survivorship (Heo, Chun, Oh, Noh, & Kim, 2017). The incidence of depression and anxiety amongst BCSs is predicted by a number of factors including disease severity, degree of patient disability and impairment, ability to engage in activities of daily living, previous history of mental illness and/or psychological treatment, lack of intimate/supportive relationships, younger age, and stressful non-cancer life events (Burgess et al., 2005; Reich et al., 2008).

Depression can have a negative impact on BCSs' interpersonal relationships, occupational performance, overall stress and coping, and perceptions of health and physical symptoms (Reich et al., 2008). Studies have consistently linked depression with lower QoL in BC populations (Ganz et al., 2003; Reich et al., 2008; Weitzner, Meyers, Stuebing, & Saleeba, 1997). In particular, depressive symptoms have been demonstrated to have a negative influence on a number and severity of side effects from treatment as well as compliance with medical treatments and thus survival, due to changes in appetite, weight, sleep, energy, and cognitive functioning (i.e., difficulty concentrating); all of which can compromise QoL (Reich et al., 2008; Somerset, Stout, Miller, & Musselman, 2004; Stafford et al., 2015). Other determinants of reduced QoL include number of lifetime stressful events, poor body image, compromised sexuality and sexual functioning, financial stressors, and anxious preoccupations (Andritsch, Dietmaier, Hofmann, Zloklikovits, & Samonigg, 2007).

In light of the detrimental impact of BC on women's mental health, there has been a

growing interest in the potential for PA to alleviate psychological distress and symptoms. Preliminary research suggests that PA is negatively correlated with anxiety and depression, and positively correlated with higher QoL among BCSs (Courneya et al., 1999, Courneya et al., 2003; Leach et al., 2016; Milne, Gordon, Guilfoyle, Wallman, & Courneya, 2007; Mock et al., 1994, 1997, 2001; Young-McCaughn et al., 2003; Rock & Demark-Wahnefried, 2002; Rooney & Wald, 2007; Swisher et al., 2015; Valenti et al., 2008; Visovsky & Dvorak, 2005).

Relatedly, it has been found that the absence of PA is related to decreased QoL in BC patients who are receiving, or have recently completed treatment (Leach et al., 2016). Kell, Bell, and Quinney (2001) found resistance training and stretching to not only be associated with increased musculoskeletal fitness, but also with greater health status and overall QoL. It has also been found that BCSs who maintained regular PA during treatment, or who returned to such following active treatment, reported higher QoL than those who were inactive after treatment even if they were routinely active prior to diagnosis (Courneya & Friedenrich, 1997). A recent review of 36 studies of QoL and cancer found that aerobic training during or after treatment resulted in improvements in physical well-being (i.e., exercise capacity, flexibility, body composition, fatigue, muscular endurance, pain, nausea, diarrhea) as well as psychological well-being (i.e., sense of control, depression, self-esteem, life satisfaction) (Courneya, Mackey, & Jones, 2000; Visovsky & Dvorak, 2005).

It has been hypothesized that exercise may promote biological (e.g., muscle growth, weight loss, improved digestion and metabolic processing, increased energy, endorphin release), psychological (e.g., improved mood, self-efficacy, sense of mastery, increased body image and self-esteem) and social (e.g., behavioural activation, interpersonal connectedness, increased social support) functioning, which contributes to positive coping, adjustment and self-efficacy

and subsequently alleviates or prevents the occurrence of negative symptoms or buffers against their potential impact on daily functioning (Courneya, 2003; Visovsky & Dvorak, 2005).

Self-esteem and body image. BCSs undergo a variety of physical and functional changes that significantly impact the integrity, experience, and perception of their bodies (Male, Fergus, & Cullen, 2016). There are a number of factors that seem to determine the extent to which a woman's body image is compromised by BC, including: 1) severity of illness and type of treatment (with advanced cancers and more invasive or radical treatments experiencing worse body image) (Bober, Giobbie-Hurder, Emmons, Winer, & Partridge, 2013; Chen, Liao, Chen, Chan, & Chen, 2011; Raggio, Butryn, Arigo, Mikorski, & Palmer, 2014; Rosenberg et al., 2013); 2) changes to appearance (e.g., loss of hair, breast(s) or parts thereof, scars, weight gain, lymphedema or swelling) (Mosher et al., 2013); 3) post-treatment body weight (with posttreatment weight gain predicting worse body satisfaction) (Gilbert, Ussher, & Perz, 2013; Raggio et al., 2014), and 4) age (with greater body image concerns and difficulty adjusting to body changes occurring amongst younger women [i.e., below age 50 years]) (Andrzejczak, Markocka-Maczka, & Lewandowski, 2013; Barsotti Santos, Ford, Dos Santos, & Vieira, 2014; Chen et al., 2011; Travado & Reis, 2013).

Thirty-one to 58% of BCSs consider themselves to be less attractive and more dissatisfied with their bodies than they were before treatment (Andrzejczak et al., 2013; Begovic-Juhant, Chmielewski, Iwuagwu, & Chapman, 2012), 73% report feeling less desired, 44% uncomfortable exposing their body and 38% less confident (Ussher, Perz, & Gilbert, 2012). Not surprisingly, BCSs score relatively worse on measures of body satisfaction than do women in the general population (Raggio et al., 2014) and, in fact, score similarly to obese women seeking weight-loss treatment (Foster, Wadden, & Vogt, 1997), implying especially low body

satisfaction among obese BCSs.

The literature suggests that body image concerns amongst BCSs persist over time (Brunet, Sabiston, & Burke, 2013; Kang et al., 2018; Male et al., 2016; Raggio et al., 2014). One study found that women felt similarly about their body image three years following mastectomy as they did 10 months after surgery (Fallbjörk, Rasmussen, Karlsson, & Salander, 2012). Another study found that 31% of stage II-III breast cancer survivors struggled with body image four years after surgery, and 27%, continued to struggle seven years post-surgery (Falk Dahl, Reinertsen, Nesvold, Fosså, & Dahl, 2010). There is a need for the development of interventions that address these disturbances in self-image, which are unlikely to resolve naturally.

Theoretical and Practical Foundations of Program Development

The Healthy Lifestyle Modification after Breast Cancer (HLM-ABC) program is a holistic intervention that takes into account individual behavioural, emotional, physical, and cognitive determinants of motivation and subsequent health. In addition to consideration of unique personal factors, the program recognizes behaviour change as occurring within broader social and environmental systems, and considers the reciprocal, dynamic interaction between these various factors. The development of this intervention was influenced by a number of theories and practical guidelines, including systems theory, self-determination theory, and motivational interviewing. Several of these theories and related practices (e.g., self-determination theory, self-monitoring, 'NICE' guidelines) have been reliably used in the development of PA interventions for BCSs, particularly for the purposes of enhancing motivation, engagement, and adherence (Pudkasam et al., 2018).

Self-determination theory. Self-determination theory (SDT) takes an empirical life science approach to understanding and predicting the social factors that facilitate and impede on

human thriving (i.e., psychological growth, engagement, and wellness) (Ryan & Deci, 2017). The theory posits that all human beings have inherent tendencies to explore, engage, and understand the world around them, as well as to internalize and integrate social norms and rules; these strivings are reliably driven by basic needs of feeling competent, autonomous, and related.

SDT's theory of motivation states that there are different types of motivation, some that stem from a person's interests, values, and volition, and some that are determined by external coercion or pressure (Ryan & Deci, 2017). The theory argues that motivation differs not only in terms of its strength, but because it is driven by various sources, it is also experienced in different contexts, and leads to various behaviours that differ in performance, engagement, commitment, and ultimate health outcome. SDT characterizes different types of motivation by the degree to which they represent autonomous versus controlled regulations. Autonomous behaviours are those that involve the experience of volition and willing engagement, whereas controlled behaviours are those that involve feelings of external or internal pressure, often to act in ways that are inconsistent with their sense of self. Autonomous and controlled motivations are related to, but different from, intrinsic and extrinsic motivation.

Intrinsic motivation leads to behaviour that is considered inherently interesting or rewarding because it generates feelings of enjoyment or mastery, whereas extrinsic motivation leads to behaviour that is necessary to reap some other benefit, such as an external reward, social reinforcement, avoidance of punishment, or achievement of a desired outcome (Ryan & Deci, 2017). While intrinsically motivated behaviours are always autonomous, extrinsically motivated behaviours can vary in the extent to which they are autonomous or controlled. For example, a person may be extrinsically motivated to make healthy lifestyle changes to avoid negative appraisal or feedback from their health provider, in which case their behaviour would be

relatively controlled; however, they may also be extrinsically motivated to make the same changes because they wish to enhance their overall functioning and quality of life, which they highly value, and therefore their behaviour would be relatively autonomous. SDT proposes that long-term behaviour change (as opposed to acute health decisions) is most effective and lasting when the person making the change is autonomously motivated and perceives oneself to be competent in making the change (Ryan & Deci, 2017). It also asserts that people are more likely to experience these two things when the change is attempted in an autonomy-granting—rather than controlling or "amotivating" (p. 455)—social environments.

Research that has examined SDT in the context of weight loss and healthy eating indicates that adoption and maintenance of such is best accomplished when individual motivation is autonomous and when social supports (e.g., family, friends, health care providers) create environments that are autonomy-supportive rather than controlling or directive (Dominguez et al., 2013; Fortier, Sweet, O'Sullivan, & Williams, 2007; Gorin, Powers, Koestner, Wing, & Raynor, 2013; McSpadden, Patrick, Oh, Yaroch, Dwyer, & Nebeling, 2016; Ng, Ntoumanis, & Thogersen-Ntoumani, 2013; Ng, Ntoumanis, Thogersen-Ntoumani, Stott, & Hindle, 2013; Pelletier, Dion, Slovinec-D'Angelo, & Reid, 2004; Silva et al., 2011; Teixeria, Patrick, & Mata, 2011). Autonomous motivation has been found to predict greater treatment adherence and weight loss, as well as sustained exercise and weight loss at follow-up (Williams, Grow, Freedman, Ryan, & Deci, 1996). Conversely, research demonstrates that when people are extrinsically motivated to engage in healthy eating and exercise (i.e., for financial incentive), they enjoy these activities less and have poorer weight loss outcomes (Moller, Buscemi, McFadden, Hedeker, & Spring, 2014).

Applied to health behaviour change amongst BCSs, when women feel pressured by external expectations (e.g., health professional recommendations) or internal demands (e.g., to attain a desired weight) to engage in PA, they are extrinsically motivated. On the other hand, if they feel motivated to do so because they experience PA as enjoyable, pleasurable, or inherently valuable, they are intrinsically motivated (Milne, Wallman, Guilfoyle, Gordon, & Courneya, 2008). One study that was based on SDT found that BCSs who met PA recommendations had higher scores of intrinsic motivation than those who were below the recommended PA guidelines (Milne et al., 2008). Another study found that BCSs whose motivation was autonomous were more likely to engage in MVPA and experience positive feelings, whereas those whose motivation was controlled were more likely to experience cancer-related anxiety, negative affect, and symptoms of depression (Brunet, Gunnell, Gaudreau, & Sabiston, 2015).

Mindfulness and self-awareness. SDT emphasizes the importance of human capacity for self-reflection and awareness—particularly the ability to recognize one's own needs, values and goals, and the difference between experiences of autonomous self-control and of being controlled (Ryan & Deci, 2017). This capacity for awareness, also referred to as "mindfulness", is argued to play a significant role in fostering autonomy and healthy self-regulation (Ryan and Deci, 2017). The authors of this approach argue that mindfulness helps people identify and process both internal (i.e., feelings, needs, values) and external information (e.g., social consequences) that they may then reflect upon and integrate in order to make effective choices.

The concept of mindfulness has been applied to health behaviour change in the practice of behavioural self-monitoring. Self-monitoring in the case of weight management is the act of recording the frequency, type, and amount of food and beverage consumed and/or activity engaged in. Self-monitoring is thought to initiate a cyclical change process beginning with

observation and recording of a target behaviour, followed by self-evaluation, leading to self-regulation in the form of continuing or adjusting the behaviour toward advancement of one's goals (Kanfer & Karoly, 1972). Tracking these behaviours fosters ongoing self-awareness, volition regarding behaviours engaged in (including the behaviour of monitoring), and a sense of competence or mastery while tracking progress. Self-monitoring of diet and PA is a well-established part of effective weight loss interventions, and those who track their eating habits more regularly and completely seem to have the most successful outcomes (Burke, Wang, & Sevick, 2011). While there tends to be a gradual decline in the use of self-monitoring over the course of time (i.e., following completion of active intervention), one systematic review predicted that with increased use of technology, the practice of self-monitoring may become less burdensome and therefore more convenient to uphold (Burke et al., 2011).

Mindfulness can also be practiced in the form of "mindful" (Kristeller & Lieberstein, 2016; Wnuk & Du, 2017) or "intuitive" eating (Tribole and Resch, 2012). This practice involves nonjudgmental awareness of physical and emotional sensations related to eating and intentional choices regarding the same. More specifically, it involves noticing physical hunger cues and psychological cravings to eat, being aware of internal sensations and satiety cues in relation to eating, and making deliberate consumption choices in response to such awareness (Kristeller & Wolever, 2011). This practice is thought to address problematic or 'mindless' over-consumption of unhealthy but tasty foods by slowing down the eating process and moderating the type and amount of food ingested, heightening awareness of food cravings and preferences, while enhancing taste and enjoyment of both more and less nutritious choices (Mason et al., 2016). Mindful eating represents a promising strategy for sustained weight loss (O'Reilly, Cook, Spruijt-Metz, & Black, 2014), particularly given its association with increased eating self-

efficacy, weight loss, and PA (Mason et al., 2016). A systematic review of mindfulness-based interventions for obesity found that 86% of studies demonstrated improvements in eating habits (O'Reilly et al., 2014).

Motivational interviewing. Motivational interviewing (MI) is defined as "a collaborative conversation style for strengthening a person's own motivation and commitment to change" (Rollnick & Miller, 2013, p. 23). It takes a person-centered (Rogers, 1965) approach to resolving ambivalence — a natural psychological experience of wanting change while simultaneously not wanting change (Rollnick & Miller, 2013) — by focusing on and evoking a person's strengths and inherent wisdom and experience as opposed to assessing for and 'treating' deficits. Like SDT, MI places emphasis on individuals' inherent tendency toward growth, which can be optimized (or compromised) through various psychological processes.

MI is comprised of four general processes: engaging, focusing, evoking, and planning (Rollnick & Miller, 2013). These processes generally progress in this order initially but not necessarily, and can overlap and lead from one to another in any order. The first of these processes, "engaging," refers to establishing an effective and therapeutic working relationship within which to safely explore one's motivations. "Focusing" involves directing the attention of the conversation to a particular area of potential change, such as obesity, increasing PA, or healthy eating. The process of "evoking" involves drawing out a person's own motivation for change (i.e., autonomous motivation) and having them express their own thoughts, feelings, reasons, and hypothetical plans for such—as opposed to identifying or explaining these things to them. "Planning" involves developing both commitment to change as well as an action plan, and occurs once a person experiences a sense of readiness and begins to think and talk about when

and how they may change. People may seek information and advice about how to achieve the desired change during this process.

These four processes are enacted with a particular MI attitude or 'spirit,' which involves elements of partnership, acceptance, evocation, and compassion (Rollnick & Miller, 2013). "Partnership" refers to a stance of collaboration, mutual respect, and attunement to both the client or patient's aspirations and one's own (and how they may align or differ). To act from a mindset of "acceptance" is to wholeheartedly believe in and prize the inherent worth of those with whom we are engaged in MI, to take an active interest and effort in empathizing with their experience, to honour and respect their right to autonomy and freedom, and to acknowledge and reinforce their strengths and efforts (Rogers, 1962, 1980; Rollnick & Miller, 2013). "Evocation" refers to a trust in, and elicitation of, a person's innate strengths, knowledge, and motivations (as opposed to instilling or imposing such). Finally, "compassion" refers to a deliberate prioritization and commitment to the person's needs and promotion of their welfare (Rollnick & Miller, 2013).

MI has been adapted (Clifford & Curtis, 2016) and successfully implemented in health behaviour change interventions with both patient and non-patient samples (Pudkasam et al., 2018). Specifically, it has been studied and demonstrated to be a promising approach to promoting PA among BC survivors and patients. Armer and colleagues (2009) investigated the effects of nurses using MI to motivate BCSs to engage in regular exercise and found that this technique led to significant improvements in participants' agency regarding self-care. MI has also been shown to increase self-efficacy and contribute to high rates of adherence (i.e., 70%) in overweight BCSs who participated in a 12-week diet and exercise intervention that involved six sessions of telephone-based MI (Sheppard et al., 2016).

Another single-arm study (without a control group) of a 16-week home-based cardiovascular and strength training intervention for BCSs that included an MI component (delivered in-person and over the phone) found that participants' weekly exercise time, aerobic fitness, and QoL improved from baseline to post-intervention (Spector, Deal, Amos, Yang, & Battaglini, 2013). Additionally, a randomized controlled trial that evaluated a six-month exercise program for long-term BCSS found that those who also received three sessions of MI (once in-person and twice by phone) had higher levels of weekly PA and energy expenditure than those who participated in the exercise program alone without MI (Bennett, Lyons, Winters-Stone, Nail, & Scherer, 2007). Of interest is that those participants in the MI condition with high levels of baseline exercise self-efficacy increased their levels of PA more so than did those with low self-efficacy.

Another pilot-randomized study examined the effects of a 12-month intervention that incorporated educational material and telephone-based MI to improve diet and exercise among BC patients undergoing chemotherapy (Djuric et al., 2011). While the sample size was insufficient to detect significance, the researchers found a positive correlation between the MI condition and lower gains in percentage body fat, self-reported helpfulness of the program, and increased engagement (Djuric et al., 2011). Clifford and Curtis recommend directly addressing barriers that may interfere with health behaviour change including "perceived lack of time, perceived lack of convenience, fear of injury, poor self-efficacy, unrealistic expectations, and negative self-talk" (Clifford & Curtis, 2016, p. 225).

General systems theory. General systems theory (GST) is an interdisciplinary theory that was originally developed by Ludwig von Bertalanffy (1949, 1950, 1968) and provides a framework to understand various phenomena from a holistic approach—that is, how distinct

parts of a complex, organized system interrelate and operate as a whole toward a broader purpose (Mele et al., 2010). GST posits that full and complete comprehension of a phenomenon requires more than an analysis of its various components, and rather a higher-level conceptualization of how these elements function as a whole (Mele et al., 2010; von Bertalanffy, 1968).

Some basic assumptions of systems theory are that all systems share common universal characteristics, and that levels of systems are encompassing in nature, in that new characteristics at one level generalize upward to all other higher levels but not downward to more basic levels (Bowler, 1981; Skyttner, 1996). Additionally, it is assumed that the universe is a complex hierarchical system that subsumes simpler interrelated sets of systems, some of which are generative and some of which are degenerative, that will continue to exist indefinitely, so long as one set of systems does not outbalance or eliminate the other (Bowler, 1981). Furthermore, the theory contends that all systems, at all levels of existence, share certain universal characteristics, are closed by boundaries that determine inclusion and exclusion from the system, and that all things in existence, including those that are concrete and metaphysical, represent organized systems of energy, matter and information (Bowler, 198; Skyttner, 1996).

Systems are thought to share the following properties: (1) interrelationship and interdependence of elements and qualities; (2) holism defined by the sum of all parts; (3) integrated functioning toward an ultimate goal or state of equilibrium; (4) goal-advancement through transformation of inputs into outputs (within a system and from/to its environment); (5) tendency toward entropy (i.e., disorder) that can be offset temporarily in living system by assimilation of energy from the environment; (6) cohesive and dynamic feedback and regulation amongst its constituents through detection and adjustment for deviations from equilibrium or stability; (7) hierarchical organization of smaller subsystems existing within larger, more

complex systems; (8) variation and differentiation of internal functions; and (9) capacity for 'equifinality' of the same outcome by way of alternate processes and for 'multifinality' of different outcomes occurring from the same initial state (Skyttner, 1996).

Systems theory would argue that in order to best understand and influence the phenomenon of *overweightness in breast cancer survivors,* one must take a holistic perspective that accounts for the various components and systems that determine such. Through a systems lens, a person's weight and body composition represents only one aspect of their broader health, which is comprised of a multitude of personal behaviours, emotions, physiological sensations, and thoughts—all of which function together within a larger social context to achieve a state of homeostasis, or what may be referred to as health status. From this view, there are a variety of flexible and adaptable ways in which a person (and their environment) can influence the state of their health (and related weight).

This is promising, as a healthy change in one part of a person's overall system has the potential to influence other parts in a positively reinforcing process (e.g., having a positive thought about one's ability to exercise may lead to increased PA which in turn might improve one's mood); however it also means that a negative shift in one part of the system can have a negatively reinforcing effect (e.g., pain associated with PA can lead to negative emotions and beliefs about such behaviour). Hence, a change in one area of a person's functioning can, in turn, influence other aspects of their lifestyle, and vice versa. Additionally, a change in one part/level of a system that is too sudden or great can compromise the ability of the other parts/levels to regulate and oscillate toward a returned state of equilibrium; thus, such a drastic change thus has the potential to overwhelm the system at large and is unlikely to be accommodated by the system, or the person's lifestyle. As such, in order to achieve sustained change, such as weight

loss or other physical health benefits, one must consider how, to what extent, and at what pace, a person's broader lifestyle and context is likely to accommodate, or reject, such a shift in the system's homeostasis.

National Institute for Health and Care Excellence guidelines. The National Institute for Health and Care Excellence (NICE) was originally founded in 1999 with the intention of "reducing variation in the availability and quality of National Health Service treatments and care" (NICE, 2014). The NICE provides guidance and suggestions aimed at improving health and social care based on the production of evidence-based recommendations, development of standards and performance metrics for health care providers, and provision of a range of information services.

The following guidelines were developed by the NICE for providers of lifestyle weight management programs based on effective weight loss strategies, and were incorporated into the HLM-ABC program protocol: incorporate multiple lifestyle components including diet, PA, and other behaviour changes; develop by a multidisciplinary team (e.g., dietitian, psychologist); deliver by trained staff who engage in regular professional development; focus on long-term lifestyle change and prevention of future weight gain; establish specific and agreed-upon dietary targets tailored to individual needs and goals without 'banning' specific foods or food groups; consider individual input from a registered dietitian; discuss reduction of sedentary behaviour and types of PA that can easily be integrated into everyday life and maintained over time (e.g., walking); integrate a number of different behaviour-change strategies that involve education, problem solving, goal-setting, social support or changes in one's environment that can facilitate lifestyle change, self-monitoring, and individualized feedback; tailor to the needs of participants so that the program is accessible and convenient to all; monitor indicators of behaviour change

and participants' personal goals throughout the course of the intervention; and adopt a respectful, non-judgmental approach (NICE, 2019).

Cognitive behaviour therapy. Cognitive behaviour therapy (CBT) is a form of psychotherapy that evolved out of Aaron Beck's (1964) Cognitive Therapy—a structured, short-term, present-focused therapy aimed at solving problems and modifying inaccurate and unhelpful thoughts and behaviours. CBT theorizes that psychological dysfunction stems from distorted thinking, which negatively affects emotions, physiology, and behaviour. CBT formulates problems in living (e.g., obesity, sedentariness) according to a model of how these four facets of a person's functioning (cognitions, emotions, physical sensations, and behaviours) reciprocally influence one another—sometimes referred to as the 'hot cross bun' model (Padesky & Greenberger, 1995)—and seeks to improve functioning by directly modifying thoughts and behaviours. Figure 1 is a visual representation of this model, adapted specifically to the presenting problems of the current study sample and serves as the overarching conceptual framework for the HLM-ABC intervention. For a comprehensive summary of CBT, see Beck's foundational book, "Cognitive Behavior Therapy: Basics and Beyond" (2011).

Clifford and Curtis (2016) discuss how CBT can be used as a complementary and integrative strategy alongside MI when applied to nutrition and exercise. They outline a number of "common traps when thinking about physical activity" including "the all-or-nothing trap," the "guilt trap," and the "exercise as punishment trap" (p. 227). The authors provide a rationale for helping people become aware of unhelpful or de-motivating cognitions, and supporting them, in a non-authoritative manner, to develop more positive and motivating self-talk.

CBT has been demonstrated to be an effective weight loss treatment (Cooper et al., 2010; Kalodner & DeLucia, 1991; Leal & Ramos, 2012; Munsch et al., 2007), and particularly with

BCSs (Mefferd et al., 2007). Furthermore, the NICE has identified cognitive restructuring as a recommended behavioural strategy for obesity management in adults (2014). The research suggests that the efficacy of CBT for weight management may be increased when delivered in a group format due to the suspected benefits of mutual support, and when combined with individualized nutritional and PA strategies (Leal & Ramos, 2012). As with most weight loss interventions, while the short-term effectiveness of CBT is well-established, the long-term maintenance of such effects are less supported (Cooper et al., 2010).

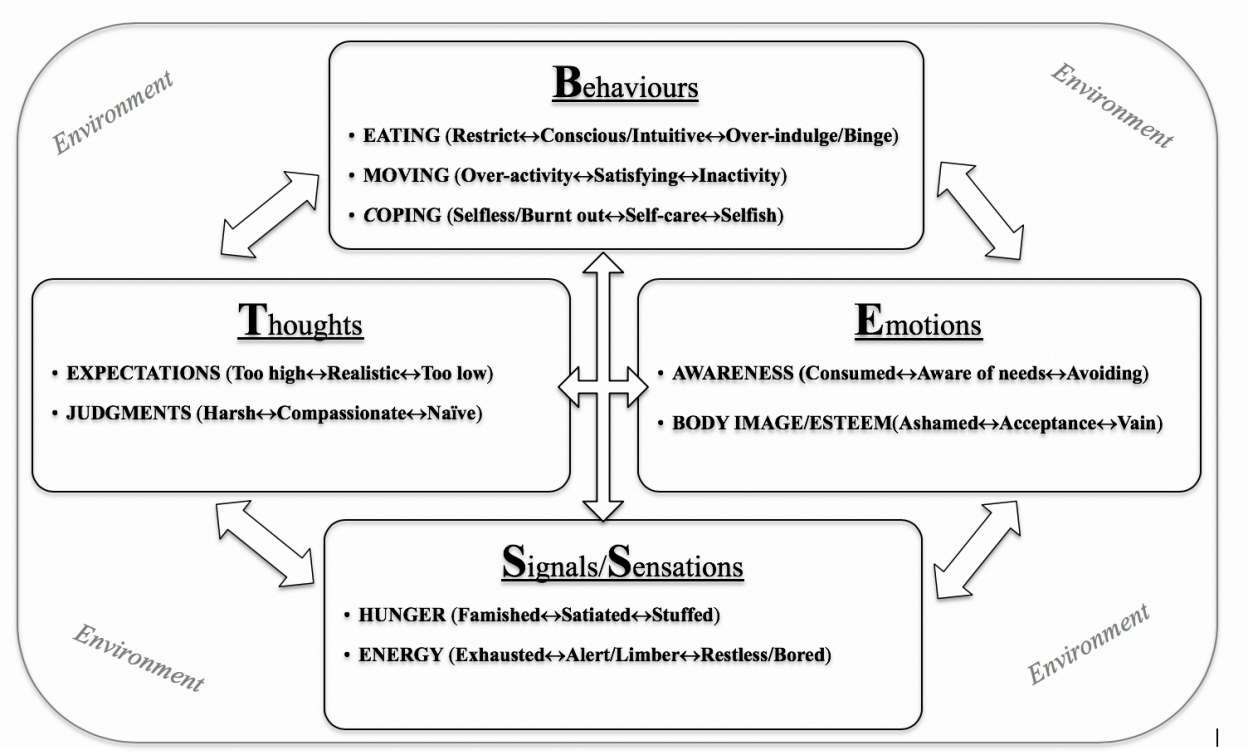

Figure 1. "B.E.S.T. System" model. Provides the conceptual framework for the HLM-ABC intervention.

Purpose of Current Study

There is a clear need for interventions that support healthy weight management and psychological well-being in BCSs. Such trials are in their early stages and have primarily included modification of diet alone, exercise alone, or both. Results have been mixed, especially regarding the effects of dietary change alone (Davies et al., 2006; Pierce et al., 2007; Thomson et al., 2005) but generally support the benefits of exercise (Rock et al., 2012) and combined diet and exercise on weight loss and improved QoL in cancer survivors (Bekkering et al., 2006; Rooney & Wald, 2007).

Despite indications that diet and exercise interventions lead to improvements in physical health and mental health, there remains a lack of consistent evidence that these gains are

maintained following active participation in treatment —because many studies lack follow-up data altogether, lack longer-term follow-up data (i.e., beyond 3-6 months post-intervention), or when longer-term follow-up data (i.e., 48-months post-intervention) is available, such effects are rarely sustained over time (Campbell et al., 2012; Greenlee et al., 2012; Pinto & Maruyama, 1999; Thomson et al., 2005). As such, there is a need for more follow-up investigation of these interventions to determine their potential to produce enduring effects, as well as for development and refinement of techniques that improve long-term weight management and comorbid psychological wellness. Current guidelines recommend a multi-component lifestyle approach as psychological treatment of choice in management, delivered by a multidisciplinary team (Cassin, 2017).

The present study involved the development and evaluation of an online group-based lifestyle intervention that integrates evidence-based behavioural (i.e., nutrition and PA) knowledge and strategies with individual factors that variably influence a person's adoption and maintenance of healthy living (i.e., motivation, problem-solving, self-monitoring, realistic and sustainable goal-setting, reinforcement of goal-directive behaviours), in the context of BC survivorship (i.e., low mood, fatigue, poor body image, increased desire to live according to one's values). The program is founded on a number of theoretical and practical principles, including those of self-determination theory, MI, systems theory, as well as the National Institute for Health and Care Excellence (NICE) guidelines for lifestyle weight management programs.

CHAPTER III: Methods

Study Aims

The broad aim of this study is to evaluate the feasibility of an online group-based lifestyle intervention for BCSs. A proposed definition of "feasibility", based on a number of funded grants from the National Cancer Institute (Bowen, Kreuter, Spring, Cofta-Woerpel, et al., 2009), is any form of investigation that is intended to prepare for a larger-scale study or trial, of an intervention. Feasibility research is used to determine whether initial findings are meaningful and justifiable to pursue further development and investigation.

Bowen and colleagues (2009) outline eight areas of focus that are addressed by feasibility studies, three of which represent the specific aims of the present study: 1) "implementation," 2) "acceptability," and 3) "limited-effectiveness testing." "Implementation" refers to investigations involving "the extent, likelihood, and manner in which an intervention can be fully implemented as planned and proposed, often in an uncontrolled design" (Bowen et al., 2009, p. 3). "Acceptability" is defined as the study of "how the intended individual recipients—both targeted individuals and those involved in implementing programs—react to the intervention" (Bowen et al., 2009, p. 3). The question of whether an intervention is acceptable concerns the extent to which it is evaluated as "suitable, satisfying, or attractive" to participants and/or those who implement it. Finally, "limited-effectiveness testing" is intended "to test an intervention in a limited way. Such tests may be conducted in a convenience sample, with intermediate rather than final outcomes, with shorter follow-up periods, or with limited statistical power" (Bowen et al., 2009, p. 3). Limited effectiveness answers the question of whether a new program demonstrates promise, or has the potential to be successful by measuring its preliminary impact on a number of target variables.

Research Questions

Question 1. Can this novel intervention feasibly be implemented as planned and proposed?

Question 2. Do the recipients of the intervention (i.e., BCSs) react to the intervention in a way that demonstrates that they evaluate it as acceptable?

Question 3. Does this intervention demonstrate promise in terms of helping BCSs achieve and maintain greater physical (weight, BMI, and waist circumference), behavioural health (intuitive eating and PA levels), and psychosocial (attitudes toward change, psychological distress, QoL, and body image) health?

Hypotheses

Hypothesis 1. This program is feasible to implement, as demonstrated by rates of enrolment, attrition, and homework completion, frequency of discussion board posting, group alliance scores, and qualitative feedback from participants.

Hypothesis 2. This program is acceptable, as demonstrated by ratings of program expectancy and treatment satisfaction, and qualitative feedback from participants.

Hypothesis 3. This program demonstrates limited-effectiveness in terms of improving and maintaining participants' physical, behavioural, and psychosocial health as indicated by quantitative and qualitative indicators assessed at baseline, post-treatment, 6-months follow-up, and 12-months follow-up.

Study Design

This pilot study employed an exploratory single-arm, mixed-method concurrent triangulation design for the purposes of developing and evaluating the feasibility of a novel online lifestyle intervention for overweight breast cancer survivors—the HLM-ABC program. Specifically, the study assessed the intervention's (1) implementation (2) acceptability, and (3)

limited-effectiveness. Findings from various sources of independent and complementary qualitative and quantitative data were compared, contrasted and integrated to determine each of these study aims. Given the small sample size and exploratory nature of this pilot study, qualitative and quantitative methods were combined, or triangulated, in such a way to increase "comprehensiveness" and "confidence" (O'Cathain, 2011, p. 577) in the findings.

Participants

Eligibility. Inclusion criteria required that participants: 1) be female; 2) be 21 years or older, 3) have been diagnosed with primary BC (stages I-III), 4) have completed active treatment within the previous 5 years, 5) have a BMI above 25 ("overweight" category) or report a weight increase of 10 pounds or more post-treatment, 6) be available to commit to a 10-week program involving approximately two hours per week, 7) be comfortable using, and have access to, a computer and secure Internet connection, and 8) can read and write in English. Exclusion criteria include: 1) current diagnosis of metastatic cancer, 2) diagnosis of a mental health condition that would interfere with their own, or another group members' ability to benefit from the group (e.g., psychosis), 3) diagnosis of an additional unmanaged/untreated medical condition, 4) plans to undergo a medical procedure within the next year, and 5) plans to participate in another structured weight loss program or take weight loss medication within the next year.

Procedures

Research ethics board approval. Ethics approval was obtained from Sunnybrook Health Sciences Centre (SHSC)'s Research Ethics Office (339-2014) and York University's Office of Research Ethics (Sunnybrook Approval –339-2014). The trial has also been registered at clinicaltrials.gov, under the ID CBCF-092014.

Recruitment. Staff oncologists, nurses, dieticians and physiotherapists at the SHSC were

informed about the study through internal email, as well as through presentations delivered at interprofessional rounds by the writer and her academic supervisor (Dr. Karen Fergus, Clinical Psychologist at SHSC). These healthcare professionals actively informed patients of the study and obtained their verbal consent to be contacted by a member of the research team for a telephone screening interview. The study was also advertised to patients through flyers posted at the SHSC, as well as through community-based organizations such as Willow Breast Cancer Support Canada. Study flyers included a telephone number to a confidential voicemail and email address that prospective participants were instructed to contact to leave a message for the research team.

Screening. For those women who provided consent to their healthcare providers to be contacted for the study, the research coordinator (RC) (a graduate trainee at York University in clinical psychology) obtained their contact information from the referring provider and called them directly by telephone to schedule and conduct a screening interview. For those women who learned of the study by flyer and left phone or email messages, the RC checked these on a weekly basis and responded by the same means to schedule a screening interview. During this interview, the RC provided detailed information about the purpose and procedures of the study, answered prospective participants' questions, obtained informed consent (Appendix A), and determined eligibility using a structured screening interview protocol (Appendix B). In addition to collecting demographics, medical information, and psychiatric history during this interview, PA readiness was assessed. Screening interviews lasted approximately 45 minutes to one hour, and responses were recorded in pen directly on the printed interview protocol. Copies of the completed screening interviews were stored in a locked filing cabinet in the key-accessed Psychosocial Oncology Laboratory at York University. Recruitment occurred on a rolling basis

between September 7, 2016 and June 16, 2017. Once enough participants had been enrolled to run a group (a minimum of 6 women), the Principal Investigator (PI), who was also the primary group facilitator (i.e., the writer, D. Male), contacted each participant to conduct an intake interview and notify group members of the start date. This process occurred twice, for a total of two successive online groups, or cohorts ($N = 14$).

Intake interview. Once participants were enrolled in the study, the primary group facilitator contacted them by telephone for an intake interview (Appendix C). The practical purposes of this one-hour phone call were to: establish contact with group members and inform them of the program start date; gather information regarding past and current eating and exercise preferences and habits, available social support(s), previous weight loss efforts, successes, and challenges; outline the intervention components and group member responsibilities (i.e., watch weekly videos, post on discussion board , complete homework assignments for feedback); provide detailed instructions for accessing the online group platform; and schedule their first measurement visit to SHSC (or for rural participants, discuss how and when to have their measurements taken remotely with the involvement of a local health care provider and review instructions for completion of electronic, password-protected self-report measures). The purposes of this initial phone conversation were to begin to 1) develop participants' sense of relatedness and promote feelings of autonomy and competence regarding behaviour change (from a SDT perspective), as well as 2) commence a MI conversation with particular focus on facilitating engagement and establishment of a collaborative focus regarding change. The personal information that was obtained during these interviews was used to tailor the program concepts and guidelines to respective group members as well as to draw upon and affirm participants' inherent wisdom and experience.

Baseline and repeated outcome measures data collection. The majority of participants (*n* = 12) visited the Louise Temerty Breast Centre (LTBC) at SHSC in Toronto to complete collection of baseline data and repeated outcome measures. During the baseline visit (T0), participants reviewed and signed the informed consent form (verbal consent was already obtained over the phone during intake interviews), as well as completed a one-time demographic/medical information questionnaire (Appendix D) and Program Expectancy Questionnaire (Appendix E). Repeated measurements were collected at pre-treatment (T0), post-treatment (T1), 6-months follow-up (T2), and 12-months follow-up (T3) and involved measurement of body weight, height, and waist circumference by a registered dietician, and completion of a set of self-report questionnaires (outlined below; see Appendices C and D). Upon completion of the program (T1), in addition to completing the standard repeated measures, participants also completed a one-time Treatment Satisfaction Questionnaire (TSQ) (Appendix F) that was included in their questionnaire package.

Two (*n* = 2) of the participants resided outside of the Greater Toronto Area and were unable to attend the LTBC for data collection; thus, an alternative procedure was implemented for these women. In order to complete the baseline forms (informed consent form, demographic/medical survey, and program expectancy questionnaire) and the repeated measures self-report questionnaire package, these two participants were emailed password-protected copies of the files to be completed either electronically or by printing and responding using pen-and-paper. In order to collect their anthropometric measurements remotely, these participants solicited the involvement of a local health care provider (i.e., family physician, nurse). They were provided with detailed written and visual instructions from the research coordinator regarding the standard measurement procedure for BMI and waist circumference, consistent with

the method used by the dieticians at the LTBC. The local health care provider recorded this information on a standard form that was also provided by the research coordinator. Once completed, these participants were instructed to return their recorded anthropometric measures and self-report questionnaire package to the investigators by either faxing or emailing the material to a secure, confidential fax number or email address affiliated with SHSC.

Post-treatment interview. Upon completion of the 10-week intervention, participants were contacted by a paid Research Assistant (RA) in the York University Psychosocial Oncology Lab to participate in a post-treatment feedback interview. This RA was unknown to the participants and had no other involvement in the study. She had six years research experience conducting telephone interviews with cancer patients. The purpose of this interview was to solicit individualized feedback from participants, in their own words, about their experiences in the program in order to evaluate program acceptability. Interviews were audio-recorded with the participants' informed consent, and subsequently transcribed by another volunteer RA into text format. Both audio and text files were stored electronically on a private, password protected shared drive on York University's secure network.

The post-treatment interviews were semi-structured according to an interview protocol (Appendix E) and were intended to solicit individualized, open-ended feedback from participants in their own words, about their experiences in the HLM-ABC intervention. The interviews lasted approximately 60 minutes and questions were organized around four areas of interest: (1) overall experience of the program, (2) experience of the online format, (3) experience of the group facilitators, and (4) perceptions of health behaviour change since participating in the program. Participants were encouraged to provide frank feedback, both critical and favourable, regarding the program. Sample questions from the interview protocol included.; "What was your

experience of having this program offered as part of a group with other women, as opposed to doing this one-on-one with a facilitator online?"; "What, if any, were the challenges to your participation?"; "What was it like to take part in an online (versus in-person) program?"; "Do you feel that you are living a healthier lifestyle now, after having participated in the healthy lifestyle group?"; "How confident are you that you can maintain the changes that you have made? How do you plan on doing so?"

Healthy Lifestyle Modification after Breast Cancer (HLM-ABC) Intervention Protocol

The HLM-ABC program is a 10-week at-home, online-delivered group-format lifestyle intervention. The intervention goes beyond behavioural diet and exercise prescription to incorporate principles and practices of self-determination theory, self-monitoring, mindfulness, MI, and CBT (i.e., cognitive restructuring, behavioural activation). The program is aimed at fostering small, gradual changes in thinking and doing that are in line with one's values and promote experiences of autonomy, competence, and relatedness and are therefore more likely to be accommodated into participants' lifestyles, and thus sustained. Because intrinsically motivated behaviour is more likely to become habitual and maintained over time, the HLM-ABC intervention aimed to increase participants' intrinsic motivation for healthy eating and moving. Similarly, given that higher levels of intrinsic motivation have been linked to increased levels of social support in BCSs (Cadmus-Bertram, Marcus, Patterson, Parker, & Morey, 2015), the HLM-ABC intervention was implemented in a group format whereby participants communicated with one another through asynchronous, text postings on the discussion board.

Online platform. Delivery of the online intervention took place through 'Moodle@York', an open-source "learning management system" that can be used to deliver courses or programs entirely online. The platform features customizable management features

that can be used to create private websites that offer interactive, closed-access exchange of information via sharing and uploading of documents, as well as asynchronous communication via discussion forums.

Participants were expected to log in, at least once each week but ideally more often, to the secure Moodle@York website using a personal identification and password. Once logged in, they were expected to review and discuss weekly psycho-educational material geared at teaching and promoting new and healthier ways of thinking, feeling, and behaving. Discussion forum about the program content and participants' reactions to it were posted asynchronously on the website's bulletin board, meaning that participants were able to access the group at any time, from any personal computer or device, for the duration of the intervention. The group was closed, meaning that it was only accessible to the registered participants and the two group facilitators. At the beginning of each week, the facilitators posted a message on the discussion forum to introduce that week's topic, upload the relevant psychoeducational material, and pose questions to facilitate group discussion. They also provided clear instructions about the homework to be completed over the week ahead. The group facilitators monitored the discussion forum on a daily basis and posted messages in response to the participants' posts and questions related to homework, and promoted further group interaction. At the end of the week, participants were expected to submit their homework assignments online (which were reviewed by the facilitators who returned feedback privately), and to comment on their experience of the homework on the discussion board.

Confidentiality and security. The Moodle@York platform has enhanced security features over and above the general Moodle platform because Moodle@York is securely installed and only accessible through York University's Learn@York services, which caters to authenticated

members or affiliates of York University by assigning them a secured "PassportYork" login that in turn provides access to a range of computing resources with enhanced security features. For instance, logging into Moodle@York with a secured Passport York login encrypts usernames and passwords before transmitting them across the Internet. Moodle@York is accessed through the URL *https://learn.yorku.ca/moodle/login/index.php*, with "http" signifying that the website is communicated over "hypertext transfer protocol," and the "s" representing that communications occur within a connection encrypted by "Transport Layer Security," which authenticates the website and protects the privacy and integrity of information exchanged. In summary, hosting a website over an "https" secure server ensures that website users are interacting with the website and other users that they intend to, by protecting against third party 'attacks,' 'eavesdropping,' or tampering with the content of communications. Another security feature of Moodle@York is that users can only be granted access to the online intervention group and 'course' contents if the group facilitators individually add them. This feature allows for enhanced control and confirmation of group membership. Furthermore, in order to promote confidentiality, Moodle@York is designed so that only group facilitators can see homework assignments that members have submitted. Group members were instructed not to disclose any personally identifying information, and to limit their introductions and usernames to first names only.

The Moodle@York platform had an optional feature to upload a personal 'Avatar' (i.e., a customizable visual identifier); however, participants were instructed to use non-identifying images if they wished to use this feature. In addition, as is customary in the running of in-person support groups, participants were also educated about the importance of maintaining confidentiality and, despite preventative measures, should they learn of another user's sensitive or personally identifying information, not to share this with anyone outside of the group. Finally,

Learn@York operates under the UIT/YorkU domain, which has excellent protection against hacks on the server level. To ensure protection against hacks at the user level, participants were instructed on best online practices, including saving their login ID and passwords somewhere private, and accessing the website on personal, rather than public, computers.

Facilitator roles and tasks. The online intervention was developed and implemented by the PI/writer (D. Male), a Doctoral Candidate in Clinical Psychology, and her academic supervisor (Dr. Karen Fergus), a senior Licensed Clinical Psychologist working as a Scientist-Practitioner at SHSC. In terms of the group facilitators' backgrounds, D. Male was familiar with the processes and facilitation of online groups through her master's thesis research, for which she conducted an in-depth qualitative analysis of 989 pages of archived transcripts of online group discussion (Male, Fergus, & Stephen, 2015, 2017). She also possessed previous clinical experience facilitating several in-person therapy and psycho-educational groups. The second facilitator (Dr. Fergus) had extensive (i.e., 20 years) research and clinical experience with online and in-person group facilitation in the area of psychosocial oncology.

The facilitators' roles were to structure and guide the weekly online process by releasing/posting pre-recorded educational videos, continuously monitoring and engaging group members in asynchronous discussion board text communication, and reviewing homework submissions and providing individualized written feedback regarding the same. Following the initial implementation of the program with the first cohort ($n = 5$) and observation of long delays or 'silences' in response to group members' posts on the DB, the facilitators adjusted their approach to the DB slightly with the second cohort. Firstly, the second cohort was delayed to begin until a larger ($n \geq 8$) group could be formed to ensure overall greater volume of posting. Secondly, facilitators adopted a process of consistently posting a reply by the end of day (i.e.,

midnight) to all unanswered DB messages; these responses included, at minimum, validation of the participants' experience and solicitation of the other group members' reactions. This effort was intended to allow for adequate time for group members themselves to ideally be the first to respond to their peers, but to ensure that the person who posted was always acknowledged and reinforced for doing so within a reasonable timeframe. Also based on clinical observations and feedback from women in the first cohort, one of the facilitators (D. Male) conducted a mid-intervention phone call during Week 5 with each participant in the second group to promote program engagement through approximately 30-45 minutes of motivational interviewing.

Specific clinical tasks (Table 1) were carried out in an MI spirit, through application of relevant techniques of *informing and advising*, *asking open questions*, *affirming*, *reflective listening*, and *summarizing* (Rollnick & Miller, 2013). The facilitators' clinical approach was also fundamentally grounded in SDT, with a broad awareness and goal of promoting feelings of competence, autonomy, and relatedness amongst group members.

Table 1

Facilitator tasks, organized by motivational interviewing (MI) principles.

MI Principle	Facilitator Task
Informing and Advising	• Deliver psychoeducational material through weekly videos • Share clinically-informed and/or evidence-based psycho-education on group discussion board in response to participant questions/comments • Deliberate repeated use of intervention language/terms (e.g., "danger zone," "balance," "pause, distract, check-in," "staying on course," "80-20%") in videos, discussion board posts, and homework feedback to consolidate learning • 'Scaffold' and offer practical suggestions to build on successes • Collaboratively assist in problem solving (e.g., help identify barriers to goals and develop concrete, manageable, realistic solutions) • Inform and remind participants of ongoing study procedures (e.g., data collection timelines, dates of post-treatment phone call)
Asking Open Questions	• Pose rhetorical questions to stimulate self-reflection (e.g., *"I wonder whether your hunger levels from this week's diaries are typical for you, or whether this reflects a change since starting to pay more attention to your hunger signals?"*) • Re-direct questions back to group members when doing so may promote feelings of autonomy, competence, or relatedness (e.g., *"Hm... interesting question… I'm curious, do you have any ideas? Do others have ideas/suggestions?"*) • Invite mutual sharing and support for purposes of fostering relatedness (e.g., "*For our final posts, let's envision joining each other on this picnic blanket, and as we each 'take a seat', let's share: (1) one *virtual item* that we are bringing to the picnic to enjoy with one another, and (2) what we're most thankful to one another for or have appreciated most about this experience together."*)
Affirming	• Acknowledge any/all successive efforts to foster feelings of competence by positively reinforcing new goal-directed behaviours and providing encouragement/praise for healthy existing knowledge and habits • Respect and promote individual autonomy by non-judgmentally and realistically identifying, acknowledging and validating individual preferences, values, limits
Reflective Listening	• Attune to participants' experiences of growth/insight and comment upon such • Provide feedback regarding processes that seem to be indicative of change • Explicitly reflect back implicit information conveyed • Disclosure of genuine impressions/reactions (e.g., *"I am thankful for your dedication—to your health, to this program each week, and to being a part of this study," "I have learned a LOT from each of you!"*)
Summarizing	• Identify themes, patterns, and trends as observed in homework or as expressed on discussion board (e.g., associations between eating patterns and certain times of day or emotions, tendencies to eat beyond reported feelings/ratings of satiety) • Post summaries on discussion board regarding topics covered, insights made, progress demonstrated • Facilitate debriefing and consolidation of learning at the end of the intervention by inviting participants to share reflections, insights (e.g., "*For your posts this week, please share with one another what sorts of things are you doing differently now, as a result of being a part of this group."*)

Weekly content. The HLM-ABC intervention is a 10-week, online intervention delivered in a group format (n = 5; n = 9). The program includes multiple interactive components, including educational videos, weekly discussion board communication, and electronic homework assignments that participants receive individualized feedback on. The intervention follows the same format each week. On the designated first day of the group week (i.e., Sunday), (Step 1) facilitators release a new video, post a related discussion topic on the discussion board, and upload the week's homework assignment (i.e., worksheet and instructions). Throughout the week, (Step 2) participants comment and respond to one another on the discussion board (at least once but ideally more often) while also completing their individual homework. Meanwhile, facilitators continuously (i.e., at least twice daily) monitor the discussion board and respond and/or invite additional commentary from group members after allowing adequate time (i.e., three posts or by day's end) for them to reply to one another first. On the final day of the group week (i.e., Saturday), (Step 3) participants submit (i.e., 'upload') their homework assignments privately using a function on the Moodle@York platform that allows only facilitators, and no other group members, to view these files. The following day (i.e., Sunday), the weekly cycle recommences with the facilitators posting the new video, discussion topic, and homework assignments related to that week's learning topic. From week two onward, facilitators also review each participant's homework throughout the week and return the same with written feedback/commentary no later than the end of the week when the next assignment is due (i.e., Saturday).

Given that the research emphasizes autonomous choice, intrinsic enjoyment, and self-awareness in making lasting behaviour change (Ryan & Deci, 2017), along with the lack of empirical consensus for the efficacy of any one diet or exercise plan for weight loss, the current

study opted to take a flexible, autonomy-supportive approach to eating and moving that promoted broad education and knowledge, personal awareness, and individual choice. Table 2 provides a summary of the educational content and homework assignments delivered over the course of the 10-week intervention.

Table 2

Healthy Lifestyle Modification after Breast Cancer (HLM-ABC) Intervention Weekly Outline

Week	Topic	Educational Content	Practice Homework
Initial log-in	Welcome/ Practice	○ Introduction to facilitators, group format and responsibilities, general topics to be covered	1. Practice assignment 2. Introductions
1	Getting Started	○ Foundational principles and conceptual framework ○ Behaviours, Emotions, Sensations, Thoughts (BEST), balanced "blue zones, systemic balance, 80-20% rule, shifting from external to internal focus, daily planning	1. Food List 2. Weekly diary
2	Eating Consciously/ Intuitively	○ What and How of eating ○ Plate method (proportions) ○ Snacks as bridge between meals ○ Hunger scale and hunger type	1. Daily diaries 2. Pause, distract, check-in 3. My danger zones
3	Let's Get Moving	○ Tips for increasing and maintaining activity ○ Behavioural activation ○ Steady climb vs. final destination	1. Diaries 2. My Satisfying Movements 3. Putting my Movements to the Satisfaction Test
4	Barriers to Staying on Course	○ Planning for inevitability of 'falling 'off track' ○ Triggers and barriers ○ 3 saboteurs (Drill Sergeant, Rebel, Quitter) ○ S.U.R.E. thinking (sudden, unrealistic, rigid, extreme)	1. Diaries 2. Reviewing the play
5	Overcoming Barriers (Staying on Course)	○ Cultivating your Inner Coach ○ G.R.A.B. principles (gradual, realistic, adaptable, balanced) ○ Coach's tips: set schedule, show up prepared, realistic standards, check in often, recognize your efforts	1. Diaries 2. Call in the Coach
6	Getting Emotionally Aware and Practicing Self-Care	○ Reasons for eating ○ The dangerous cycle of emotional eating ○ Basic emotion states and triggers ○ Eating as a 'Bandaid' for emotional discomfort/pain ○ Interrupting the emotional eating cycle: Take C.A.R.E. (Catch, Acknowledge, Recognize, Engage) ○ Emotions and corresponding needs and action tendencies ○ Proactive self-care ('oxygen mask' metaphor)	1. Diaries 2. Taking C.A.R.E. with emotional 'falls' *(in-the-moment self-care)* 3. Investing in Me *(proactive self-care)*
7	Body Image and Self Esteem	○ Defining body image ○ How breast cancer relates to body image ○ Respecting/accepting your body ○ The Body Bully vs. Self-Compassion/Coach	1. Diaries 2. Strengthening your self-compassion reflex 3. Check the checking
8	Reviewing the Journey	○ Review of major principles and strategies ○ B.E.S.T. 'Road Map' ○ B.E.S.T. Players	1. Review and practice exercises from 'Repertoire of B.E.S.T. practices'
9	Looking Ahead	○ Anticipation of set-backs, relapse prevention, troubleshooting for maintenance ○ Focus on group discussion, consolidation, and support	1. Repetition and practice of homework for feedback
10	Take-aways and goodbyes	○ Reflect upon progress and mutual support ○ Consolidate gains ○ Group discussion, consolidation, and support (no video)	1. Repetition and practice of homework for feedback

Week 1: Welcome and orientation. Once participants activated their Moodle@York accounts and successfully logged in to the interactive website, they were instructed to access a set of orientation materials, including a 'Welcome' video that (1) introduced the group facilitators by name, qualifications, and photo, (2) provided a rationale and overview of the HLM-ABC intervention, (3) outlined group member responsibilities, and (4) oriented them to the online platform, including instructions on how to post a 'practice' discussion board entry and download, complete, save, and re-submit a 'practice' homework assignment.

Week 2: Getting Started. Week two introduced basic foundational concepts of the program, including taking a holistic, balanced, gradual, and systemic approach to lifestyle modification. This week also introduced the overarching program framework—the "B.E.S.T. system" model (Figure 1)—to provide a rationale for why and how the program aims to increase awareness and modification of behaviours (i.e., eating, moving), emotions (i.e., mastery, failure, self-esteem, emotional eating), sensations (i.e., shifting from external to internal focus, awareness of hunger and satiety signals), and thoughts (i.e., self-talk, beliefs). Participants are taught to consider how each of these aspects of one's experience can range from one extreme (e.g., restricted eating, excessive exercise) to another (e.g., binge eating, inactivity), with balance (e.g., eating to the point of satiety, moderate PA) being the goal of sustainable health. For homework, participants were instructed to review a comprehensive list of healthy foods produced by Canada's Food Guide (Health Canada, n.d.) and individualize it by identifying personal preferences, eliminating unfavourable items, and adding to it a list of "fun foods" that they would not deny themselves but limit considerably because they were not particularly nutritious and/or high in calories. They were also provided a template for a weekly food and PA diary to maintain.

Week 3: Eating more consciously and intuitively. The third week focused on teaching the 'what' and 'how' of healthy eating, in terms of general principles (e.g., biology and evolutionary function of hunger, long-term consequences of dietary restriction, mindful/intuitive eating) and guidelines (e.g., food groups, recommended snacking options and frequency, incorporation of diverse nutrients, 'plate method' proportions) that participants were encouraged to adapt to their individual preferences and lives. Participants were also taught how to maintain a more detailed daily food diary that involved developing awareness of, and recording, hunger types (i.e., biological, taste/craving, or emotional), and levels (on a scale of 1 to 10, with 1 being "starving and feeling weak/dizzy" and 10 being "so full you feel sick"). Educating participants and providing them with a sense of choice amongst various options and information was intended to support feelings of autonomy and competence. The educational video for this week also included a picture of, and introduction to, the two dieticians who were involved in developing the intervention (particularly the dietary guidelines and recommendations) and collecting data (i.e., anthropometric measurements). Assigned homework involved (1) maintaining the new daily food diary, (2) tracking personal 'danger zones' (i.e., times and places when vulnerable to excessive or unhealthy eating), and (3) practicing an exercise called 'take pause' designed to help interrupt over-eating through use of mindfulness of hunger signals, distraction, and autonomous choice.

Week 4: Let's get moving. The focus of Week 4 was on promoting increased PA through evidence-based strategies (i.e., behavioural activation, positive reinforcement, planning, pacing, problem-solving). A general message was that "any and all movement counts," and two general principles were emphasized: (1) "movement" includes any form of formal (e.g., biking, weight training) or informal (e.g., taking stairs instead of elevator, housecleaning, walking the dog) PA;

and (2) small steps/choices over time result in greater distances/differences. In addition to maintaining a diary as in previous weeks, this week's homework involved developing a personal list of physical activities that generate feelings of satisfaction (i.e., accomplishment and/or enjoyment) and rating them from 1 to 10 (1 being minimal satisfaction and 10 being the highest possible feeling of satisfaction). After completing this list, participants were instructed to choose three of these activities to schedule into their week ahead, rate their *anticipated* level of satisfaction prior to engaging in each activity, and re-rate their *actual* level of satisfaction after engaging in the activity, along with any reflections about how they felt during and afterward.

Week 5: Barriers to staying on course. The fifth week addressed the inevitability of 'falling off track' of goal-directed plans and behaviour, and the importance of continued awareness of and recommitment to such in long-term success. Emphasis was placed on increasing awareness and anticipation of personal barriers, noticing when barriers are interfering with effective behaviour without judging or blaming oneself, and choosing to return to healthy practices. The educational video reviewed general approaches to change (i.e., sudden, unrealistic, rigid, extreme [S.U.R.E.]) that are likely to thwart long-term progress, and examined such in detail in relation to 'self-sabotaging' cognitions. The video reviewed the influence of such thoughts on emotions, sensations, and behaviours according to the B.E.S.T. system model (Figure 1) and explained how to recognize such thinking. For homework, participants were encouraged to continue using their diaries. They were also instructed on how to complete a CBT-adapted 'thought record' in relation to challenging eating- and activity-related situations, including a column to identify relevant cognitive barriers.

Week 6: Overcoming barriers (staying on course). Week 6 directly built upon the previous week by teaching participants strategies (i.e., cognitive restructuring) for overcoming

negative, or sabotaging self-talk—namely through cultivating an 'inner coach' whereby one may replace S.U.R.E. thinking with gradual, realistic, adaptable, balanced (G.R.A.B.) thoughts. Assigned homework expanded upon that from the previous week, by adding an additional cognitive restructuring column to the previous 'thought record,' whereby participants were encouraged to challenge their cognitive barriers (e.g., "I should go to the gym every day for at least an hour," or "that's impossible, I can't do that. I quit.") by generating coaching self-statements (e.g., "I know you're feeling tired after such a long day, and I get you don't have much energy. I wonder if you could try to go to the gym for just a half hour? Or do an easier workout today? If that still seems like too much, maybe you could do some sit-ups and push-ups while you watch TV? I know you can do something, and you'll feel really good that you did, afterwards.").

Week 7: Getting emotionally aware and practicing self-care. Week 7 aimed to address difficulties with emotional eating and inactivity through increasing awareness of primary emotions (e.g., sadness) and associated needs (e.g., attachment, comfort), presenting information regarding alternative adaptive behaviours (e.g., seeking support/contact, engaging in new experiences of value/joy) that have the advantage of directly regulating emotional needs without the unintended negative effects of emotional/mindless eating (e.g., weight gain, feelings of guilt, shame, incompetence). Emotional eating behaviour was explained in relation to the B.E.S.T. model (Figure 1), whereby uncomfortable emotions accompany negative sensations, which can generate negative thoughts and lead to impulsive/mindless behaviours that can be relieving or soothing in the short term. In addition to fostering more healthy ways of coping, this week incorporated the concept of regular, proactive self-care habits to reduce vulnerability to emotional distress and subsequent unhealthy, emotionally-driven behaviours. In addition to the

routine homework of keeping a food/movement diary, participants were instructed to record instances of emotional eating/inactivity (e.g., bingeing on ice cream, laying on the couch for hours) and to retroactively identify emotions (e.g., tired, irritable), sensations (e.g., lethargy, muscle aches), and thoughts (e.g., "Leave me alone!" "Give me a break.") that were likely driving this soothing, yet ultimately maladaptive, behaviour. Next, they were to identify the adaptive need (e.g., rest, relaxation) associated with the emotions they were experiencing, and generate alternative behaviours (e.g., read a book, take a bath, go to bed early) they could have engaged in to directly and adaptively nurture this need and/or self-soothe. In order to practice proactive self-care, participants were instructed to choose two self-nurturing activities from an extensive list, engage in these over the course of the week, and reflect upon the process, how they felt, whether they would like to engage in the behaviour again, and if so, to plan when.

Week 8. Body image and self-esteem. Week 8 introduced the concept of body image and identified various factors that can influence a woman's self-image in the context of BC, including, but not limited to: hair loss and regrowth, loss of breast(s), scarring, fatigue/low energy, low sexual desire, pain, lymphedema, changes to sex organs, treatment-induced menopause, cognitive effects/impairment associated with chemotherapy, and weight gain. The online video stressed the idea that body image is personal and individualized, and outlined a general process for coping with cancer-related body changes, beginning with (1) acknowledging and grieving loss and changes, (2) letting go of self- and other- judgments, (3) redefining one's sense of self-image and worth, (4) reclaiming or accepting 'disowned' aspects of one's self/body, and (5) retaining and continuing to acknowledge what one values and likes about oneself. This week's video also introduced strategies for recognizing and challenging thoughts and behaviours (e.g., body pinching, excessive weighing, reassurance-seeking about appearance, avoidance of

mirrors) that contribute to low self-esteem and interfere with self-acceptance (referred to as "body bullying"). For homework, participants were provided with instructions for (1) practicing self-compassion and (2) reducing or interrupting self-degrading behaviours.

Week 9. Reviewing the journey. The intention for the ninth week was to provide participants with an opportunity to review and consolidate concepts and skills learned to date. Rather than introducing new material, this week's video was a condensed synthesis of the key concepts and exercises covered in each of the previous videos. Rather than assigning new homework, group members were provided with a comprehensive set of all previous homework exercises and encouraged to choose and repeat any they wanted additional practice with and/or feedback on from the facilitators. In order to promote self-reflection and planning for sustained behaviour change, the facilitators invited group members to share with one another via the discussion board their insights, gains, and experiences of success/progress. This group discussion was also aimed at fostering feelings of competence and relatedness through mutual reinforcement and encouragement. In addition, the facilitators prompted participants to post about ongoing challenges and/or barriers that they could benefit from receiving support and/or problem-solving with.

Week 10: Take-aways and goodbyes. The final week of the program was intended to prepare participants for the transition from weekly structure, group support, and accountability to independent maintenance of new habits and practices they had begun to develop in the weeks prior. There was no video component or opportunity for homework feedback in this final week; rather the focus was on receiving and providing final exchanges of support, encouragement, and self-disclosure. Based on valuable feedback from the participants in the first cohort, the facilitators also made a deliberate effort to create a clear sense of closure and celebration during

the final week. This was done via the discussion board by describing a virtual 'goodbye' picnic whereby participants were asked to bring a meaningful food item and share "what it is that you are most thankful to one another for, or have appreciated most about this experience together." Also based on feedback from the first cohort, group members were given the option to maintain contact and support with one another after the group ended by sending a private email to the facilitators indicating an interest in such.

Feasibility Measures

Implementation. Program implementation was assessed by collecting data regarding rates of recruitment (i.e., the percentage of participants who enrolled of those who were screened) and retention (i.e., the percentage of participants who completed the program from beginning to end). In addition, implementation was assessed according to indicators of program engagement (i.e., frequency of posting on the discussion board, homework completion rate).

Group alliance, as measured by the Group Climate Questionnaire—Short Form (GCQ-S; MacKenzie, 1981), was another outcome used to assess program implementation—specifically, the extent to which a cohesive online group environment was achieved. The GCQ-S is a 12-item self-report measure, based on a longer 32-item version, intended to gauge group members' perception of group alliance. The 12 questions correspond with three factors, or subscales, of Engagement (pertaining to degree of cohesion, personal sharing, and valuing of the group), Avoidance (related to the extent to which group members evaded responsibility for facilitating change), and Conflict (concerning group members' experiences of tension and distrust) (Mackenzie, 1981). Respondents are asked to rate each question on a Likert scale from 0 ("not at all") to 6 ("extremely"). The GCQ-S is one of the most commonly used measures of group process (Burlingame, MacKenzie, & Strauss, 2004) and is considered to have good internal

reliability and construct validity, with alpha coefficients ranging from 0.88 to 0.91 (Kivlighan & Goldfine, 1991). The GCQ has been used in in-person support groups for cancer patients (Daroff , 1996), professionally facilitated telephone-delivered support groups for BC patients (Heiney et al., 2003), inpatient psychiatric populations (Mackenzie, 1983), process and special interest training groups (Mackenzie, Dies, Coche, Rutan, & Stone, 1987), discussion groups for medical interns (Kanas & Ziegler, 1984).

Another measure of implementation feasibility was a single item rating from 1 (strongly disagree) to 5 (strongly agree) to the question, "Overall, I found the program to be convenient." This question was included within the Treatment Satisfaction Questionnaire (TSQ) (Appendix F), which is described in greater detail below (acceptability measures), as the remainder of the questionnaire items were aimed at capturing the extent to which participants deemed the program, and its components, to be acceptable.

Finally, feasibility of implementation was also assessed using the Program Expectancy Questionnaire (PEQ), which was administered to all participants prior to their participation in the intervention (T0) to assess their hopefulness about the HLM-ABC program prior to commencing. The PEQ was adapted from Devilly and Borkovec (2000)'s "credibility/ expectancy questionnaire" and contains six items designed to measure the extent to which participants reasonably believe a given intervention will be at addressing their difficulties. Borkovec, Newman, Pincus, and Lytle (2002) adapted Devilly & Borkovec's (2000) original scoring strategy to one based on only a single item asking how much participants expect the identified issue/outcome to improve by the end of the intervention based on an 11-point Likert Scale ranging from 0 (0%) to 10 (100%). This approach has been found to be predictive of treatment outcomes (Ahmed, Westra, & Constantino, 2012; Price, Anderson, Henrich, &

Rothbaum, 2008; Vogel, Hansen, Stiles, & Gotestam, 2006), and thus for the purposes of the current study, program expectancy was assessed using the average score of participants' rating (from 0 [0%] to 10 [100%]) on a single question: "By the end of the program, how much improvement in your physical and mental health do you really *feel* will occur?"

In addition, qualitative findings that emerged from thematic analysis of participants' post-treatment interview data regarding the concept of implementation (i.e., the extent to which they perceived the program to have been implemented as intended) were triangulated with the above quantitative outcomes.

Acceptability. Acceptability of the HLM-ABC program was assessed according to qualitative findings that emerged through thematic analysis of participants' post-treatment interview data as well as ratings on the TSQ (Appendix F) administered upon completion of the intervention (T1). The questionnaire was comprised of 19 questions (e.g., "The weekly discussion board was important to my progress throughout the HLM-ABC program," "The total amount of interaction with the facilitators was sufficient.") that asked participants to respond with a rating of 1 (strongly disagree) to 5 (strongly agree), with space to provide written elaboration. The questionnaire also included three questions involving a Yes/No response: (1) "Did you read the homework feedback that your facilitators provided back to you?"; (2) "Would you recommend the HLM-ABC program to other BCSs looking to lose weight or make healthy changes to their lifestyle?"; and (3) "Have you ever participated in any other weight loss/healthy lifestyle programs?" In addition, the questionnaire included eight open-ended questions that participants were asked to provide a written response to (e.g., "What was the most valuable thing you learned?" "Are there any ways that we could improve this program? Please be specific about what you would like to see changed.").

Limited-effectiveness. Limited effectiveness was tested using both qualitative findings from the PTI data, as well as quantitative change scores on a number of standardized outcome measures. These outcome measures, summarized below, assess a range of anthropometric/physical (weight, waist circumference, BMI), behavioural (intuitive eating habits, PA habits), and psychosocial (motivation, self-efficacy, quality of life, emotional distress, body image) constructs thought to be influenced by treatment. These repeated measure outcomes were collected at four time-points: pre-treatment (T0), post-treatment (T1), 6-months follow-up (T2), and 12-months follow-up (T3).

Physical health. Weight was measured using a hospital grade digital scale. Waist circumference was measured using a non-elastic measuring tape at the widest part of the hips. BMI was calculated by dividing participant weight (kg) by their height (m^2), which was also measured using a tape measure. All anthropometric measures were measured using the same instruments and by the same individual across all participant and time points.

Behavioural health. Behavioural health was assessed according to two constructs—eating habits and PA habits.

Eating habits. Eating habits were measured using the Intuitive Eating Scale—2 (IES-2; Tylka & Kroon Van Diest, 2013). The IES-2 is a 23-item questionnaire that assesses an individual's degree of intuitive eating, which has been described as an adaptive way of eating, with strong connections to our internal physiological hunger and satiety cues (Tribole & Resch, 2012). Factor analysis of the IES-2 has demonstrated that its items load onto four domains: Eating for Physical Rather Than Emotional Reasons (EPR) (an individual's pattern of eating because they are physically hungry rather than to cope with emotional distress); Unconditional Permission to Eat (UPE) (an individual's willingness to eat when hungry, not stave off hunger,

and not labeling certain foods as forbidden); Reliance on Hunger and Satiety Cues (RHSC) (an individual's trust in their internal hunger and satiety cues and reliance on such cues to guide their eating behaviour); and Body-Food Choice Congruence (B-FCC) (and individual's tendency to match their food choices with their body's nutritional needs). The IES-2 has been found to be internally consistent, with Cronbach's coefficient alphas of .87 for the total 23-item IES-2, .93 for EPR, .81 for UPE, .88 for RHSC, and .87 for B-FCC (Tylka & Kroon Van Diest, 2013). In regards to test-retest reliability, the IES-2 has an intraclass correlation coefficient of .88 for the IES-2 total score, .81 for EPR, .86 for UPE, .80 for RHSC, and .77 for R-FCC; therefore, total and subscale scores have demonstrated stability over a three-week retest interval (Tylka & Kroon Van Diest, 2013).

Physical activity habits. Physical activity was measured using the Godin Leisure-Time Exercise Questionnaire (GLTEQ; Godin, 2011). The GLTEQ is a self-report measure consisting of three questions about the frequency and duration of mild, moderate, and strenuous exercise that one typically engages in during a week. The GTLEQ is one of the most commonly used questionnaires in oncology research, and has been validated for use among cancer survivors. The questionnaire has demonstrated adequate construct validity (ranging from $r = 0.32$ to 0.45 when compared to accelerometry) and reliability (intraclass correlation coefficient of 0.74 over a two-week interval) (van Poppel, Chinapaw, Mokkink, van Mechelen, & Terwee, 2010). A score less than 14 is considered to represent an 'insufficiently active/sedentary' level of PA, a score between 14-23 is considered 'moderately active,' and a score equal to or greater than 24 is considered 'active' (Godin, 2011).

Psychosocial health. Psychosocial well-being was assessed according to measures of motivation/attitudes toward change and emotional well-being.

Motivation and attitudes toward change. The Change Questionnaire (CQ; Miller & Johnson, 2008) is a 12-item measure that was developed based on research on the use of therapy clients' language when describing their own motivation for change (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003). When completing the questionnaire, respondents identify what it is that they are considering changing (e.g., living a healthier lifestyle), and items are completed with reference to that particular change. The scale includes two items representing each of the following change-related constructs: desire, ability, reasons, need, commitment, and taking steps toward. The items are rated 0 ('definitely not') to 10 ('definitely') and total scores range from 0-120, with higher scores reflecting higher levels of motivation. The CQ has demonstrated good internal consistency and test-retest reliability (Miller & Johnson, 2008).

The Exercise Self-Efficacy Scale (E-SES; Schwarzer & Renner, n.d.) is a 5-item questionnaire measuring one's personal agency and optimistic self-beliefs about being capable of adopting healthy exercise behaviours. The scale has an internal consistency (Cronbach's alpha) of 0.88 and has been found to have satisfactory construct validity, as it is significantly correlated with healthy exercise intentions ($r = 0.33$) and behaviours ($r = 0.39$) (Schwarzer & Renner, n.d.).

The Nutrition Self-Efficacy Scale (N-SES; Schwarzer & Renner, n.d.) is a 5-item questionnaire measuring one's perception of their own personal agency or control over eating. This scale has an internal consistency (Cronbach's alpha) of 0.87 and test-retest correlation of $r = 0.59$. The scale has been found to have satisfactory construct validity, as it is significantly correlated with healthy eating intentions ($r = 0.22$) and behaviours ($r = 0.34$) (Schwarzer & Renner, n.d.).

Emotional well-being and self-concept. The Functional Assessment of Cancer Therapy – For Patients with Breast Cancer (FACT-B; Brady et al., 1997) is a 44-item self-report

questionnaire designed to measure quality of life in BC patients, across various dimensions of physical well-being (e.g., “I have a lack of energy”), social well-being (e.g., “I feel close to my friends”), emotional well-being (e.g., “I feel sad”), and functional well-being (e.g., “I am able to work [include work at home]”), as well as additional breast-cancer specific concerns (e.g., “One or both of my arms are swollen or tender”) (Brady et al., 1997). The scale was developed with special consideration for patient values and brevity, and is available in nine languages. Internal consistency for the total FACT-B score is high (alpha = 0.90, $N = 295$), and subscale alpha coefficients range from 0.63 to 0.86. The scale has also demonstrated test-retest reliability, convergent validity, divergent validity, and known-groups validity (Brady et al., 1997).

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a 14-item questionnaire designed to be used with medical populations to assess various experiences related to anxiety and depression. Scores on these two subscales range from 0-21, with higher scores indicating greater levels of distress. A literature review that summarized the validity of the HADS (Bjelland, Dahl, Tangen, & Neckelmann, 2002) determined that a score of 9 or greater on the anxiety subscale, and 8 or greater on the depression subscale, are optimal cut-offs for caseness of clinically significant levels of anxiety and depression in cancer populations. The same review (Bjelland, Dahl, Tangen, et al., 2002) investigated the internal consistency of the HADS and reported Chronbach’s alpha coefficients ranging from 0.68 to 0.93 ($M = 0.83$) for the anxiety subscale, and from 0.67 to 0.90 ($M = 0.82$) for the depression subscale. When evaluated for concurrent validity with other common measures of anxiety and depression (e.g., Beck Depression Inventory, State-Trait Anxiety Inventory, Clinical Anxiety Scale, Symptom Checklist 90 Anxiety and Depression subscales), the HADS was correlated between 0.60 and 0.80, reflecting medium to strong correlations. Altogether, the research suggests that the HADS has

good to *very good* validity.

Body image was measured using the Body Image Scale (BIS; Hopwood, Fletcher, Lee, & Al Ghazal, 2001). The BIS is a 10-item questionnaire that was designed to measure body image concerns that cancer patients/survivors may have experienced during the past week, as experienced in the form of negative thoughts (e.g., "Have you been dissatisfied with your body?"), feelings (e.g., "Have you been feeling less feminine as a result of your disease or treatment?"), or behaviours (e.g., "Did you find it difficult to look at yourself naked?"). The scale was developed based on relevant literature, consultation with health professionals, and interviews with BC patients. When tested with a sample of 682 individuals with a diagnosis of BC, the total scale and individual items demonstrated high reliability, with Cronbach's alpha coefficients equal to 0.93, and ranging between 0.92 and 0.93, respectively (Hopwood et al., 2001). When the scale was assessed for test-retest reliability with 94 patients with varying cancer diagnoses (breast, large bowel, testis, gynecological, and lymphoma) who were administered the 10 items one month apart, 64% of item scores were identical on the two occasions and 89.3% item scores differed only by a score of one. A significant relationship was demonstrated between the two sets of total scores (rho = 0.70l, $p = 0.001$, Pearson correlation coefficient) and there was no significant difference found between the two sets of scores ($p = 0.51$, Wilcoxon matched-pairs signed ranks test). Overall, the BIS has been validated as a brief questionnaire suitable for use in clinical trials for assessing body image changes in cancer patients (Hopwood et al., 2001).

Analysis

Qualitative analysis. This study employed a thematic analysis (Braun & Clarke, 2006; Graneheim & Lundman, 2004) of the qualitative post-treatment interview transcript data. Thematic analysis is a method of identifying, describing, and (in some cases, including the

present study) interpreting patterns that emerge within a data set. A benefit of this method is the inherent flexibility afforded by its non-theoretical approach, which rendered it especially compatible with and applicable to the phenomenon under study—an intervention that was founded upon various theories and principles. Another benefit of such a boundless approach is that the emergent themes could be triangulated with other findings derived by different methods (i.e., quantitative analysis) to provide a more complete and richer understanding of the complex phenomena under study (feasibility, acceptability, and preliminary-effectiveness of the program).

This analysis involved both inductive and deductive approaches, at different stages of analysis. Firstly, audio recordings of the post-treatment interviews were transcribed verbatim into Microsoft Word format, and the text transcripts were then uploaded into NVivo 12 software to more easily organize and interact with the data. Each unit of analysis (i.e., single interview transcript) was read through several times by the PI (D. Male) to develop an overall sense of each participant's experience in the program. Subsequently, the text data was organized into meaning units (segments of text that together represent a distinct thought, idea, or particular meaning), which were given a code (or "node" in NVivo) intended to concisely capture the essence of the manifest content. All codes were compared against one another for similarities and differences in meaning, and organized according to higher-order categories. At this stage, codes and categories were analyzed inductively, in that they very closely reflected the manifest, organic data, as opposed to being derived from an overarching theory or deductive process applied 'top down' to the data (Braun & Clarke, 2006). Subsequently, these categories were examined against one another and as a whole, and through a process of deductively applying the broader research questions, were grouped into higher-order themes. This stage of the analysis involved a greater degree of interpretation and attention to latent themes; as such, the data were

at this point subjected to a second independent audit by the second researcher (Dr. Fergus) to ensure validity and reliability of the findings. Ultimately, the thematic findings represented patterns in participants' individual, bottom-up experience as it related to the over-arching 'sensitizing concepts' (Blumer, 1954) from the semi-structured interview (Appendix G) regarding their subjective experience and opinions of the HLM-ABC program, the online platform, the facilitators, the group element, and whether/how their health attitudes and behaviours may have changed since participating in the program.

The researchers did not passively discover the emergent findings in the data set, but rather actively interacted with the data and organized them in a way that resonated with their personal perspectives, beliefs, and hypotheses, while also attempting to be open and curious about the full range of possible patterns that could transpire from an exploratory lens. Given both researchers' doctoral-level training in clinical psychology, they held biases toward a belief in the utility and effectiveness of psychosocial interventions as well as the therapeutic benefits of group-based services. They both also obtained graduate-level training in systems theory, cognitive behavioural therapy, and MI, which strongly influenced the development of the HLM-ABC intervention. In addition, the online Moodle@York learning platform was one that both researchers were familiar with and had used in their teaching roles with York University, and as such had free access to this resource, which were primary incentives for using this particular platform. In addition to these professional biases, both researchers had an interest in, and experience with, making their own personal health behaviour changes and experienced subjective success in so doing based on the assumption that small, gradual changes are more sustainable than more drastic, sudden modifications.

Quantitative analyses. Descriptive statistics regarding enrolment, retention, program

engagement (i.e., rates of discussion board posting and homework completion), and baseline program expectancy were used to quantitatively evaluate feasibility of the HLM-ABC program. Descriptive statistics were also explored for the quantitative Treatment Satisfaction Questionnaire data for the purposes of evaluating program acceptability. Frequencies of quantitative ratings were calculated using Microsoft Excel and written responses to open-ended questions were used to provide further description to the statistics, in the form of quotations.

In order to investigate whether the HLM-ABC intervention was effective at helping breast cancer survivors achieve (and maintain) healthy changes to their physical (i.e., weight, BMI, waist circumference), behavioural (i.e., eating and PA habits), and psychosocial (i.e., QoL, body image) health, sample means and standard deviations of these various outcome measures were calculated for each of the four time points. Paired-samples t-tests were used to measure a point estimate and confidence interval of the mean difference between scores on these measures pre-intervention and post-intervention (T0 and T1), pre-intervention and six-months follow-up (T0 and T2), and pre-intervention and 12-months follow-up (T0 and T3). Given this study's small sample size and the intention of estimating power and sample size for a possible later-phase trial, the main statistic of interest reported is that of effect size (Cohen's *d*) (Gibbons, Hedeker, & Davis, 1993). The magnitude of effect sizes was interpreted according to Cohen's (1992) thresholds of $d<0.2$ defined as negligible, $d<0.5$ defined as small, $d<0.8$ defined as medium, and $d\geq 0.8$ defined as large. Effect sizes were calculated using R statistical software, using the formula:

$$S^2_d = \left(\frac{n_1+n_2}{n_1 n_2} + \frac{d^2}{2df)}\right)\left(\frac{n_1+n_2}{df}\right)$$

Mixed-method triangulation. A mixed-methods concurrent triangulation strategy was employed in the present study. Quantitative and qualitative data were collected and analyzed,

separately, with a goal of obtaining multiple viewpoints of the phenomena under study (feasibility of implementation, program acceptability, and limited-effectiveness of the program). Subsequently, the independent yet complementary results of these two data sets were merged at the phase of interpretation and discussion, to create a cohesive and comprehensive conclusion to the research questions. A mixed-method triangulation approach was deemed especially appropriate for this pilot study given its small sample size and exploratory nature; this method illuminated convergence amongst findings and therefore increased confidence" in such, while also revealing variability or exceptions amidst the multiple methods that could not be captured using only a quantitative or qualitative method alone. Triangulation of mixed methods has also been established as especially suitable for social sciences and health research (Campbell & Fiske, 1959; O'Cathain, 2011; Tariq & Woodman, 2013), as it generates a comprehensive and nuanced understanding of the (typically complex) phenomena under study.

In the present study, feasibility of implementation was determined by comparing and contrasting descriptive statistics of enrolment, retention, program engagement, and group alliance with qualitative findings that emerged from thematic analysis of the PTI data. Program acceptability was evaluated by engaging in a similar triangulation of qualitative thematic findings and quantitative descriptive analyses of the TSQ data and baseline PEQ. Finally, limited-effectiveness was assessed by interpreting the preliminary quantitative results (i.e., outcome change scores) in light of the converging and/or diverging thematic findings from the qualitative PTI data.

Epistemology

The epistemological paradigm of this mixed-method study is a combination of both postpositivism-realism and constructivism-interpretivism (Ponterotto, 2005). The quantitative

element of investigation acknowledges that the researchers and participants interact and have an influence on one another (especially because the PI/author occupied additional roles of clinician and research coordinator); however, this approach emphasizes independent and objective measurement of the phenomena under quantitative inquiry (e.g., the impact of the HLM-ABC intervention on overweight/obese BCSs' health, according to various quantifiable indices).

By combining qualitative and quantitative methodology, this study also integrates a constructivist-interpretivist lens. Therefore, this paradigm also assumes that the phenomena being investigated (e.g., the extent to which the HLM-ABC intervention is considered an acceptable and effective means of helping BCSs develop a healthier lifestyle) are determined by multiple different and equally valid experiences of those individuals who participated in the study. Additionally, this approach does not presume that the researchers and participants are independent of one another; it is believed that 'truth' is best discovered through joint pursuit and creation, by means of the researcher interacting with participants and interpreting the multiple meanings of reality they bring forth (Ponterotto, 2005).

CHAPTER IV: Results

Demographics

Demographic information and clinical sample characteristics are summarized in Table 3. After accounting for drop-outs, the first cohort consisted of five group members and the second cohort consisted of nine ($N = 14$). The first group ran between March 6 and May 25, 2017 and the second group ran between May 9 and and July 29, 2017. The average age of participants was 52.07 years ($SD = 9.75$, range 29-71 years). The average age of women at the time of breast cancer diagnosis was 49.21 years ($SD = 10.56$, range 24–70 years), and the average amount of time that had lapsed since the last active treatment (e.g., surgery, chemotherapy, or radiation) was 26.57 months ($SD = 20.21$ months, range 7–64 months). The majority of women ($n = 9$) were married, three were single, and two identified as being in a common-law partnership.

Table 3

Demographic Characteristics (N =14)

Variable	*n*	%
Ethnicity		
White/Caucasian	11	78.57
Eastern European	1	7.14
Italian	1	7.14
South African Jewish	1	7.14
Education		
High school	1	7.14
College	4	28.57
University	9	64.29
Employment status – missing data (*n* = 12)		
Working	11	91.67
Retired	1	8.33
Annual income – missing data (*n* = 13)		
$0-9,999	2	15.38
$25,000-$50,000	2	15.38
$50,000-$75,000	3	23.08
$75-%100,000	2	15.38
$100,000+	4	30.77
Number of children		
None	3	21.42
1	2	14.29
2	7	50.00
3	2	14.29
Stage of cancer		
Stage I	5	35.71
Stage II	6	42.86
Stage III	3	21.43
Surgery		
Single lumpectomy	6	42.86
Single lumpectomy followed by revision to clean margins	1	7.14
More than one lumpectomy	1	7.14
Unilateral mastectomy (followed by reconstruction)	5 (2*)	21.43 (14.30*)
Single lumpectomy followed by bilateral mastectomy (followed by reconstruction)	1	7.14
Other treatment		
Chemotherapy	9	64.29
Radiation	13	92.86
Hormonal Therapy	12	85.71
Herceptin Therapy		35.7

Note: *n* refers to the number of participants who endorsed each category. * refers to a subset of participants from a category.

Research Question 1: Feasibility of Implementation

The first aim of this study was to explore whether this novel intervention can be feasibly implemented as planned and proposed, through triangulation of quantitative and qualitative measures of recruitment and retention, baseline program expectancy, program engagement (homework completion, discussion board posting, group alliance), and program convenience.

Recruitment and retention rates. Between September 7, 2016 and June 16, 2017, recruitment for the study was open to women diagnosed with early-stage BC who self-identified, or were identified by a cancer care provider, as being overweight/obese or as having gained 10 or more pounds since active treatment. During the recruitment period, in total, 54 total prospective participants consented to be contacted by a research coordinator to learn more information about the study and screened for eligibility, including confirmation of a BMI of 25 or greater. Thirty-two (59.26%) of those women were ultimately screened for enrolment, which yielded a total of 19 (59.38%) eligible participants. Of the potential 54 women who had consented to be contacted about the study, 17 enrolled (i.e., were screened, signed consent forms, participated in the intake interview, and completed baseline measures), representing a recruitment rate of 31.48%.

Two of these 17 women who enrolled in the study decided not to participate in the intervention after completing their baseline measures and signing the informed consent form (i.e., never logged in to the online platform), resulting in fifteen women commencing active participation in the HLM-ABC intervention. Of those 15 participants, one dropped out mid-way through the intervention (in the fifth week), representing a 6.67% attrition (or 93.33% retention) rate for the intervention. Of the 14 women who completed the intervention, 6- and 12-month follow-up data was collected for all 14 (93.33% follow-up retention). Therefore, from time of enrolment to 12-month follow-up, a total of 3 women dropped out (two prior to commencing the

intervention and one during the intervention), representing a 17.65% attrition (or 82.35% retention) rate for the study. Figure 2 provides a visual diagram of participant recruitment and retention.

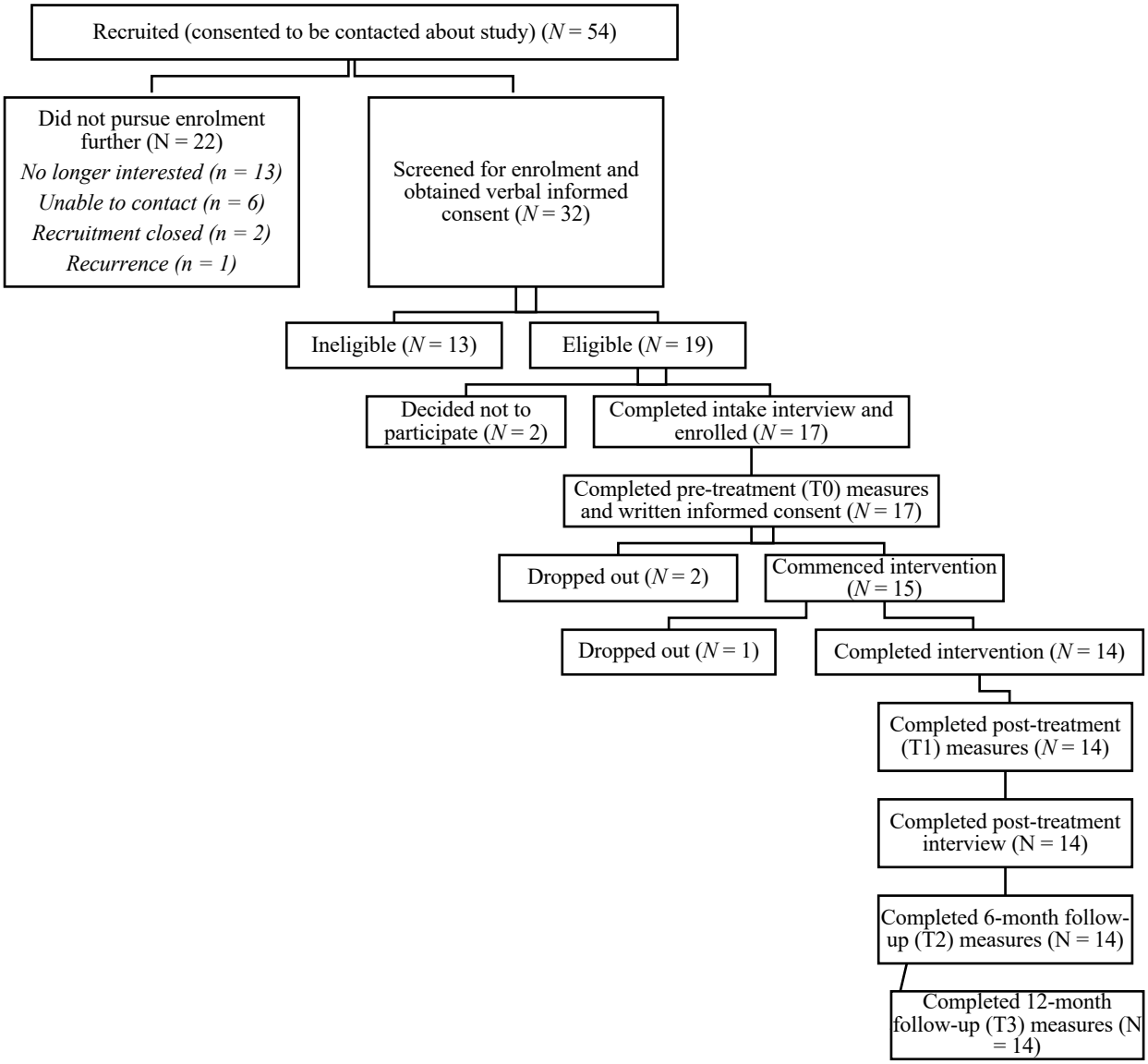

Figure 2. Participant recruitment and retention flow-chart.

Baseline program expectancy. The mean program expectancy score was 6.71/10 (*SD* = 1.38, Range 5.0-9.0), indicating that on average, participants expected that by the end of the program they would experience an approximate 67% improvement in their physical and mental health. Using the cut-point function in IBM SPSS Statistics 26 software, a cut-point of 7.0 was used to categorize participants as having either low ($n = 6$) or high ($n = 8$) program expectancy based on them having expectancy scores lower or higher than the mean, respectively.

Program engagement. Program engagement was assessed according to various indicators of participation, including homework completion, rates of posting on the group discussion board (DB), and a quantitative measure of group alliance.

Homework completion. Of the eight mandatory homework assignments, participants completed, or at least partially completed, an average of 7.29 assignments (91.07 % completion rate). The majority ($n = 10$) of participants completed all 8 assignments (100% completion rate), one participant completed 7/8 assignments (87.50% completion rate), and 3 participants completed 5/8 assignments (62.50% completion rate). Of the two optional homework assignments, only two out of 14 participants completed (or at least partially completed) them (21.43% completion rate). The total homework completion rate for all 10 (including mandatory and optional) homework assignments was 75.00%.

Discussion board engagement. A total of 194 posts were made on the discussion board (DB) from all 14 participants, over the course of the 10 weeks. The average number of posts per participant over the entire course of the program was 13.86, ranging from a total of four to 28 per participant. The average number of posts per participant per week was 1.39, ranging from 0.4 to 2.8. The average number of posts per week was 19.4, ranging from 8-36 depending on the week.

As mentioned in the study methods, deliberate efforts were made on the part of the

facilitators to increase DB engagement between the first and second group implementation (i.e., cohort); therefore, posting rates for each cohort were explored. A visual summary of the number of DB posts per week, per cohort, can be seen in Figure 3. The average number of total posts per participant over the course of the program was 10.80 for cohort 1 (ranging from four to 16 total posts) and 15.56 for cohort 2 (ranging from nine to 28 total posts). The average number of weekly posts in cohort 1 was 5.4 (ranging from 2-10 weekly posts) and 14.0 for cohort 2 (ranging from 6-31). This represents a 259% increase in average number of posts per week from the first to the second implementation of the group. The average number of weekly posts per participant was 1.08 for cohort 1 (ranging from 0.4 to 1.6 posts per week) and 1.56 for cohort 2 (ranging from 0.9 to 2.8 posts per week), representing a 44.03% increase in the average number of weekly posts per participant between the first and second implementation of the program. These data suggest that the formative efforts that were incorporated to increase DB interaction between successive group implementation resulted in increased rates of engagement.

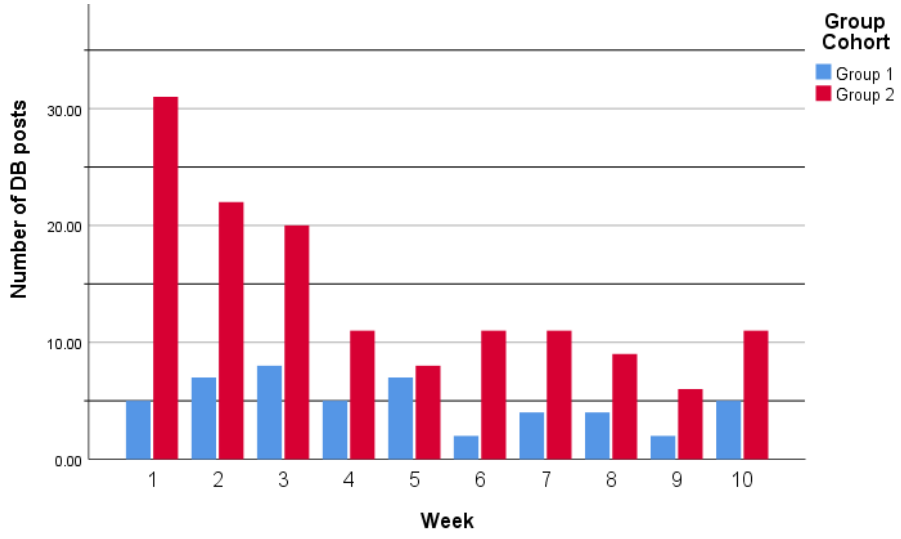

Figure 3. Number of weekly discussion board (DB) posts, by cohort 1 (n = 5) and cohort 2 (n = 9).

Group alliance. To investigate the feasibility of establishing a sense of cohesion in this

online psychoeducational group, the GCQ-S was administered to all 14 participants at post-treatment (T1). Table 4 displays the means and standard deviations for the GCQ dimension scores of group engagement, avoidance, and conflict.

Table 1

Group Climate Questionnaire (GQS) Subscale Score Means and Standard Deviations (N = 14)

GQS Subscale	*M (SD)*
Engaged	18.36 (4.05)
Avoiding	8.29 (4.39)
Conflict	1.43 (1.55)

Convenience. All 14 participants provided ratings from 1 (strongly disagree) to 5 (strongly agree) on the TSQ to the question, "Overall, I found the program to be convenient" (see Figure 4). Program convenience was rated an average of 3.86 out of 5 (*SD* = 0.86), with 71% of participants strongly agreeing or agreeing that the program was convenient. A single participant (P10) indicated that they "disagreed" the program was convenient, and elaborated that it "was difficult to find time and concentrate because of summer holidays, etc. Also was technically challenged with York site from my Gmail."

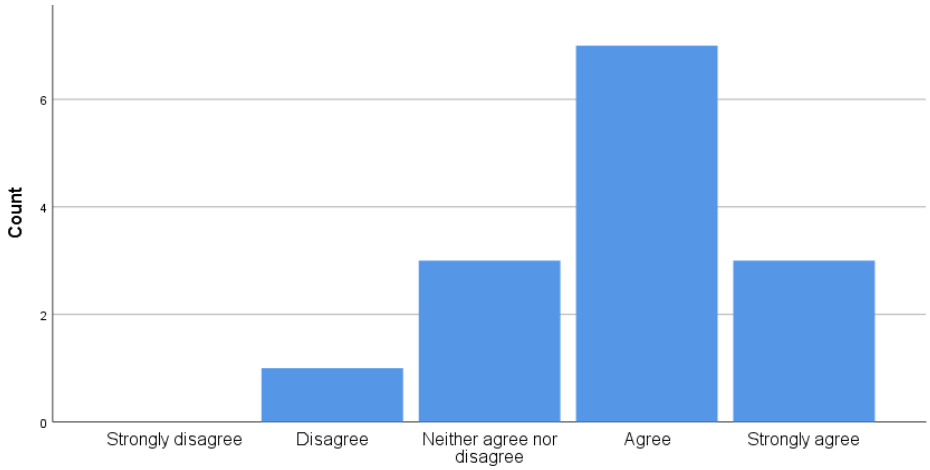

Figure 4. Simple bar count of responses to TSQ question "Overall, I found the program to be convenient."

Of the 11 participants who provided qualitative feedback during the PTIs regarding convenience of participation in the HLM-ABC program (see Table 5), 100% described it as being convenient. The convenience afforded by the online format of the program was particularly highlighted by the participants. One woman (P17) expressed that she was:

> …super glad it was given online, because if it wasn't given online, I would have never been able to access the program because, I'm 1300 miles north of [the city where the study was conducted], so I would have never been able to, and we had nothing like that here. So I would have never been able to take advantage of this program if it wasn't offered online, so I certainly do appreciate that.

Another participant (P16) spoke specifically to the convenience of the online format:

> I'm pretty sure I speak for everyone, it is such, you know, we are so tired of schlepping places and appointments and being places and that. It just was great, I felt so happy not to have to do that. And, I'm prepared to bet that if it was like, you know, face to face, that there would have been a big dropout rate.

Other ways in which the program was deemed convenient included the ongoing opportunity to participate via computer and Internet while traveling, and the flexibility to engage at various times of day when most convenient to participants' schedules. Illustrating this point, one participant (P14) expressed:

> The internet has become a great way for us to connect and to have access to all this information all the time. So I think it was great that it was online. I think it made it so you could do it kind of—I could watch it at 10 o'clock at night when I was home from work... So I think it was really good that way because it was really accessible.

The majority of participants (*n* = 10) deemed the *degree of commitment and effort involved to be feasible*. One group member (P17) reported:

> Going through the program, I found it fairly rigorous, with keeping track of all the information. … But in the end, I certainly found it beneficial because it really opened your eyes as to how you're thinking about what you're thinking and things like that.

Four participants described the degree of *weekly commitment as being too onerous*. In particular, they reported finding the homework exercises too plentiful, "too detailed" (P10), repetitive (i.e., completing daily food diaries), and not always personally relevant.

Challenges to participation. The qualitative PTI data revealed three broad types of challenges to program engagement: *circumstantial, personal*, and *technological* (Table 5). Circumstantial barriers (*n* = 9) included: competing commitments (e.g., volunteering, moving); work pressures (e.g., shift work, excessive workload); time of year (i.e., participating during the summer); and travel (e.g., difficulty accessing a computer and making healthy choices). *Personal challenges* (*n* = 11) included: discomfort examining difficult emotions; discomfort disclosing personal information on the DB; limited computer proficiency; poor self-care habits; poor time management; and longstanding psychological issues affecting broader lifestyle behaviours (e.g., recurrent depression, using excess weight "in order to hide behind" body insecurities (P13). *Technology-related challenges to engagement* (*n* = 8) included: an online platform (Moodle@York) that was accessible only by computer (i.e., incompatible with portable handheld devices such as smartphones or tablets); technical difficulties resulting in failed attempts to post on the DB; and an online interface that was reportedly difficult-to-navigate resulting in confusion submitting homework and accessing homework feedback.

Table 2

Qualitative Themes and Sub-Themes Regarding Program Convenience

Category	*n*	*%*
Theme 1: Perceived Convenience		
1.1 Program is convenient (especially due to online format)	11	79
1.2 Degree of commitment and effort is feasible	10	71
1.3 Degree of commitment is too onerous	4	29
Theme 2: Challenges to Participation		
2.1 Personal challenges	11	79
Difficulty examining difficult emotions	5	36
Limited proficiency with computer technology	5	36
Poor time management	4	29
Poor self-care habits	3	21
Discomfort disclosing personal information on the discussion board	1	7
Longstanding psychological issues affecting broader lifestyle behaviours	1	7
2.2 Circumstantial challenges	9	64
Time of year	6	43
Competing commitments	2	14
Work pressures	2	14
Travel	2	14
2.3 Technological challenges	8	57
Difficult-to-navigate online interface	5	36
Limited accessibility of online 'Moodle@York' platform	4	29
Failed attempts to post on DB	3	21

Note: *n* refers to the number of participants who endorsed each category. % refer to the percentage of participants from the overall sample who endorsed each category.

Research Question 2: Program Acceptability

A secondary aim of this study was to explore whether the HLM-ABC program is acceptable to its recipients. This was determined by examining participants' reactions to the intervention according to ratings of treatment satisfaction and qualitative findings from post-treatment feedback. The qualitative themes, including frequency of endorsement, are summarized in Table 6.

Overall program satisfaction. All 14 participants provided ratings from 1 (strongly disagree) to 5 (strongly agree) on the TSQ to the question, "Overall, how satisfied were you with the *Healthy Lifestyle Modification after Breast Cancer* program?" (see Figure 5). The mean global satisfaction score was 4.15 out of 5 (*SD* = 0.86), whereby 71% of participants indicated that they were 'very satisfied' or 'satisfied' with the program. Twenty-nine percent of participants indicated that they were "neither satisfied nor dissatisfied."

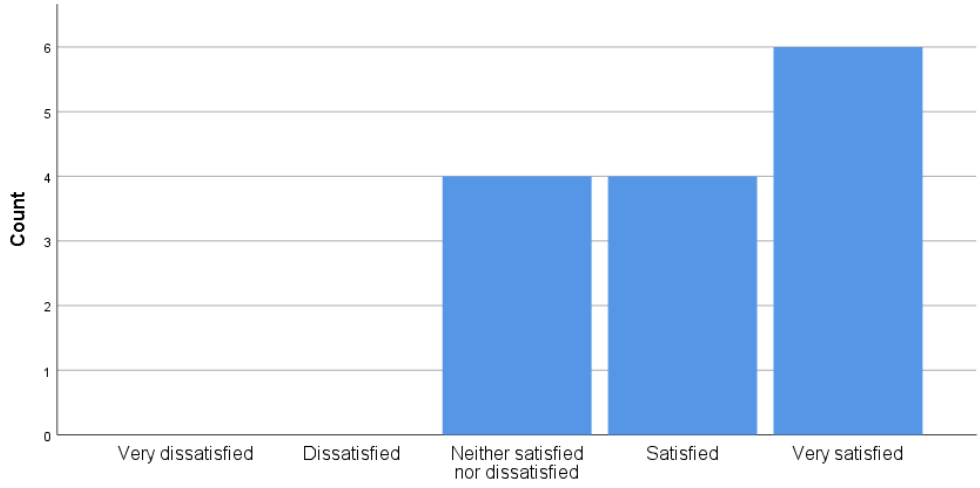

Figure 5. Simple bar count of responses to TSQ question "Overall, how satisfied were you with the HLM-ABC program?"

Positive feedback. When asked during the post-treatment interviews about overall experience taking part in the program, the majority (*n* = 12) of participants spoke positively. The

following quote provides a summary of one participant's overall satisfaction with the program:

> I think it was a great program. I do think they should run it again. I think it's really important because, as I said, we all talk about what healthy eating is and what mindfulness is but how do you actually do it and what does that look like? What I really liked about the program is that it wasn't prescriptive because I mean they don't treat cancer the same. You know everybody—one in eight women are diagnosed with breast cancer but they don't treat all of those people the same way. So how can we all subscribe to the same diet or the same exercise program or whatever? So I think the program really kind of gave you a new way to think about eating and moving, and it gave you those tools to make those changes that you need to in order to live a healthier lifestyle. Something that's really nice is that it's applicable to all breast cancer survivors, but doesn't kind of have that—like you know, across the ages, all those kinds of things, across busy lifestyles and not so busy lifestyles, and people who have kids—and you can really take what you need from the program. So I would definitely love to see it run again and will definitely, if it is run again, will share with all the breast cancer survivors I know and talk about the program because I think so much of survivorship is about knowing where to access your resources and I think that is a great one (P14).

The majority (n = 11) of participants described the program as presenting a new way of thinking about health that was different from, and more helpful than, how they had previously thought about weight loss. The first way in which the HLM-ABC program was perceived to be different was for its 1) *balanced, moderate approach to lifestyle change* (n = 10). In one participant's words, "The thing that really stood out I guess was the reframing [of] how you think about food. Like eating and moving versus diet and exercise" (P14). Another participant explained:

> This is a lifestyle change. And trust me I have done all of the diets. I've done Bernstein, I did Jenny Craig, like prior to cancer. The Bernstein one was great, I mean I dropped [weight] like crazy, and as soon as you are not getting the injections and consuming more than 500 calories, boom—you know you're jumping back up. I really like the idea that [change] was really stretched, and that's why I didn't step on the scale…(P07)

The second way participants spoke of the program being helpful was how it's 2) *internal (versus external) focus was empowering* (n = 11). One woman stated:

> I thought it was much more internally focused than anything I've ever done before. Much more, about how food made me feel, and I, I mean everything else I've ever done was

> externally focused. I mean cut calories. You know, cut out fat, cut out something. Exercise more, which were all kind of external. And this was internal. 'How do you feel when you eat? How are you feeling before you eat? How do you feel after you eat?' That kind of thing…This internal focus was very helpful for me (P04).

The participants spoke of the internal awareness they developed through the program as yielding new knowledge and capacity for greater change than they felt was previously possible. For example, one lady (P11) stated:

> It's funny because, you know, I think we're all pretty intelligent people but you're not always aware. This program does allow for at least that awareness, like that exists, that is something that you need to have a look at and then it teaches you—really just equips you to be more discerning...

Another woman (P19) explained:

> All the inner kind of reflection part was the most beneficial for me because I think that that was the stuff that I hadn't really dealt with before because I think I was trying really hard in terms of like food and choices...

The program was also deemed helpful in terms of providing an *opportunity to discuss unaddressed issues after treatment not otherwise available* (n = 10), taught new skills (n = 6), especially that of cultivating one's "inner coach" (i.e., restructuring unhelpful cognitions related to healthy behaviour); creating accountability (n = 4); and providing knowledge about healthy eating (n = 3).

The final way participants described the HLM-ABC program as being helpful was in its teaching of concepts and principles that are *flexible to fit one's unique lifestyle* (n = 3). For example, one participant explained:

> I think that, just thinking of it that way—that any kind of movement is valuable—that really helped me because I used to put a lot of pressure on myself that I wasn't going to the gym for an hour… if I wasn't doing this much cardio or that much strength training, then it really wasn't worth it. And so that's kind of shifted in me. I'm a little more laid back about what I do and how long, as long as I'm doing something. (P02).

Another participant (P14) highlighted how the intervention honoured participants'

individuality and appealed to each group member's inherent wisdom and autonomy:

> It was really nice to just have somebody distill the information in a way that didn't feel like preaching, if that makes sense. Like here's the information I'm going to present to you, and the message I found all the way throughout was that the onus was on us to incorporate it the best way possible. It didn't feel like scripted, you need to do A B C D and E. It was very much, here's the information, take from it what you will and incorporate it. I think that was kind of the really big take home, was that you can only incorporate so much as you can handle, and everybody's lifestyle means that they can handle something different. So even in the whole lecture, you only take one thing and incorporate it for the week, that's really great.

Mixed feedback. Two of the participants reported *mixed feelings about their participation* in the program, and acknowledged that this was likely influenced by their own personal preferences or experiences. One of these women explained, "I'm sort of in the middle with it. It wasn't… I didn't come away thinking it was fantastic, but I didn't think it was bad either. So, it was just sort of a medium for me… There's a lot of time and effort, you could tell, put into the program. It just wasn't really for me." [P10]. The other woman reported, "I'm quite neutral about it personally, but I'm very positive about its potential. So, I think that if I was at a different place it would have, it could have had a big impact on me." [P13].

Program expectations. According to the qualitative findings from the post-treatment interviews, of the 12 participants who commented on their expectations of the program, the majority (n = 8) expressed that their expectations were generally *met or exceeded* (i.e., gained more insight than anticipated, benefited more than they thought possible given the online format). One woman (P19) spoke of how she expected a more traditional approach to weight loss but was pleasantly surprised to receive something different:

> I thought it was just going to be like you know, food and exercise. I thought it was just going to be like, you know, you see the dietician, and I thought it was going to be like that—go over the food guide and make sure that you're having—I thought it was going to be kind of like that… So I guess it was better than I expected… I went into it specifically thinking—even though ideally the end result is to lose weight—I think I got more than that, which I wasn't expecting.

Four participants expressed feeling as though their *expectations were not met*. Specifically, they stated that they were hoping for a more directive approach involving more external accountability, and to have achieved greater change (i.e., immediate weight loss, resolution of longstanding psychological issues interfering with weight loss).

Program endorsement. On the TSQ, participants were asked to indicate 'yes' or 'no' to the question, "Would you recommend the HLM-ABC program to other breast cancer survivors who are looking to lose weight or make healthy changes to their lifestyle?" All fourteen (100%) indicated 'yes' that they would recommend the program. Qualitative findings from the PTIs converge to indicate that all 14 participants would recommend the HLM-ABC program to others. Feedback from the post-treatment interviews revealed that participants believed the program to offer a unique and different approach that others would benefit from. One participant reported:

> I think most people would enjoy the program. Like I said, it was very well done, very well thought through. It's a great program. Yeah, I would recommend it… I mean the people were great, [the facilitator] was good, and yeah the nutritionists were good. The way that it was set up was good, like I would kind of look forward to the videos every week and thought about them. Yeah, I really, it was really quite good. And it was a little bit different then I had in other programs… (P08).

Some (n = 4) participants indicated that they *would recommend the program conditional upon there being clearer expectation-setting* at the outset with respect to program commitments and anticipated outcomes. For example, one group member (P10) explained:

> I would only recommend it if I explained it to them a bit better. Like the time commitment, the homework commitment…You know, don't have expectations that you're going to lose weight [immediately]. I didn't really understand that part that clearly. So if they were okay with that, then yeah, I would recommend it. But I would tell them what's really involved, because I didn't realize it was going to be that much of a time commitment.

Another participant (P06) stated:

> Maybe if there is a time when they can mention that, you know for some people during these [ten] weeks you're going to see changes but for others you may take this with you and, you know, next month or, you know, in six months, you may start to see changes because that's when you digest it and get your head around it and that's your timing.

Acceptability of psychoeducational videos. All 14 participants provided a rating to the question, "The weekly videos were important to my progress through the HLM-ABC program," from 1 (strongly disagree) to 5 (strongly agree). The average rating for this item was 4.36 (*SD* = 0.93), whereby 86% of participants indicated that they "strongly agreed" or "agreed" (see Figure 6). Of the participants who rated this question less favourably, one elaborated, "I didn't get much from the videos, though everyone else seemed to find them valuable."

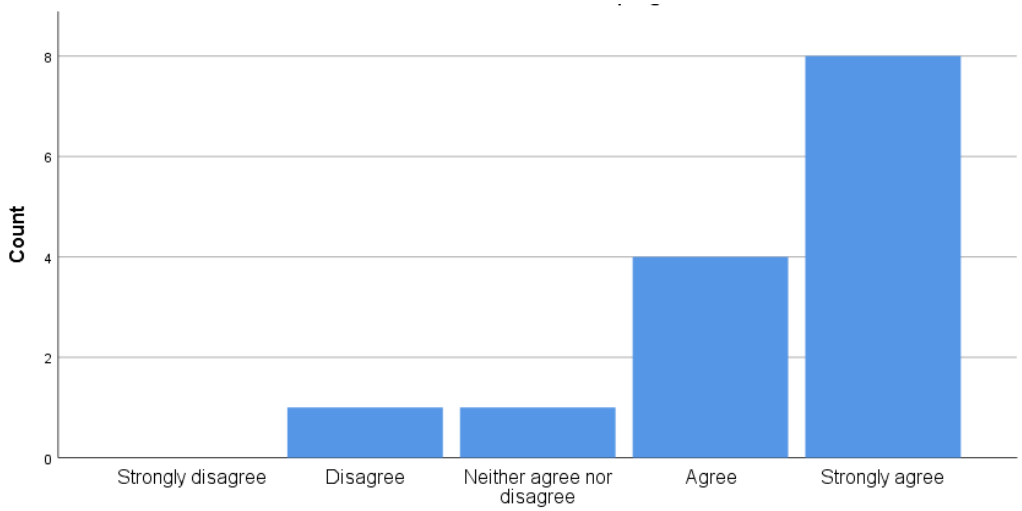

Figure 6. Simple bar count of responses to TSQ question "The weekly videos were important to my progress throughout the HLM-ABC program."

Praises. Nearly all of the participants (*n* = 13) had something positive to say in the PTI about the videos, describing them as *detailed and informative* (*n* = 11), *enjoyable* (*n* = 9), a *good length* (*n* = 3), *easy to watch at their convenience* (*n* = 3), and *being presented in a way they liked* (*n* = 3). The material conveyed in the videos was deemed to be so valuable that a number of

participants (*n* = 3) expressed a desire to have had ongoing access to them beyond their participation in the program.

Criticisms. Five of the women expressed some form of criticism about the videos, including feedback that they found them to be *slow moving* (*n* = 2) and *did not like the way the material was presented* (*n* = 1). One of these participants (P13) stated that because each video included the voice of a single facilitator, they "felt like a read script" and suggested that in order to make the videos more interactive, to present them like "a role play" or "conversation" between multiple people. Only a single participant (P10) experienced the material to be *complicated and overwhelming* and described "zoning out" at times because of this.

Some participants expressed feeling as though *nothing was missing from the program* (*n* = 4) while several described the program as missing some information, including: *more planning for continued accountability and maintenance* (*n* = 5), *greater guidance around what to eat* (*n* = 2), and *information about how to communicate with opinionated others about their lifestyle choices* (i.e., assertiveness skills) (*n* = 1).

Favourite modules. Participants were asked during their post-treatment interview what their most and least favourite modules were. They were not limited to select a single module and thus most of them identified several topics as their favourite. According to this feedback, weeks five (cognitive barriers, or "saboteurs", to maintaining healthy behaviour) and six (cognitive restructuring, or developing one's "inner coach") were the most highly rated modules, with 12 of 14 participants describing them to be among the most useful and "impactful". Only one participant described these concepts as her least favourite as she felt they did not relate to her.

The second most highly-rated module was week 3 (eating more consciously and intuitively), with 10 participants (71%) describing it as one of their favourites as it taught them

important skills. Conversely, two participants (14%) considered this module to be their least favourite, as they felt they were already knowledgeable about healthy eating guidelines and were attuned to their experiences around eating (i.e., their mood, satiety signals).

Five participants (36%) identified week 7 (getting emotionally aware and practicing self-care) as a favourite module that really resonated and helped them better prioritize themselves. Only one participant (7%) reported that week 7 was her least favourite topic as she did not identify with the concept of emotional eating.

Two participants (14%) identified week 4 (behavioural activation) as their favourite topic, as it was beneficial to introduce greater variety of movement into their lifestyle (i.e., experimenting with new activities in varying amounts). While week 4 was a favourite module for these two women, it was a least favourite for just as many; two participants (14%) considered it to be their least favourite module as they had already established consistent, enjoyable exercise habits prior to participating in the program and therefore reported that "it felt frustrating not to get started" (P16).

The final module that participants spoke of when asked about their favourite and least favourite modules, was week 8 (body image and self-esteem). One single participant (7%) spoke of the concepts covered that week as "really resonating" (P06) and therefore being among her favourites. On the other contrary, three participants (21%) spoke of week 8 as their least favourite because the concepts either did not resonate, or resonated deeply and were "very difficult" (P15) to explore. One participant explained, "Because I'm struggling with accepting, you know, the body that I have now…it's just a topic that makes me feel really angry and kind of bitter" (P02). This module was described by two of the participants as "emotional," "intense," "heavy" and "hard if you're processing it alone" (P19), while also being worthwhile (e.g., "I

learned a lot in terms of the emotional aspect" [P19]). Because this content seemed to be perceived as challenging but important to process, it was suggested that more time (i.e., an extra week) and/or attention from the facilitators (i.e., increased individual communication), be allocated to it.

Acceptability of homework. All 14 participants provided a rating to the question, "The weekly diaries and/or homework exercises were important to my progress through the HLM-ABC program" (see Figure 7). The average rating for this item was 4.14 out of 5 (*SD* = 0.77), whereby 79% of participants indicated that they "strongly agreed" or "agreed". Twenty-one percent of participants indicated that they "neither agreed nor disagreed." One of the women (P04) who "strongly agreed" elaborated, "Without the diary, I would not have realized that I eat when I`m not hungry or that I eat too much. It became clear that I am not an emotional eater generally, but in a few limited situations, like at events, I am. I also tried new activities because it was homework and they have increased my level of happiness." Another indicated, "Accountability; helpful in making me think and be aware" (P16).

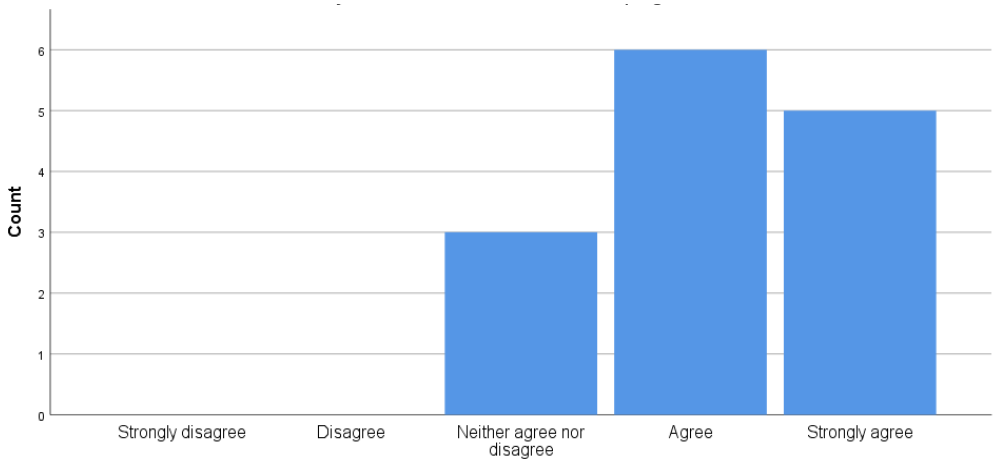

Figure 7. Simple bar count of responses to TSQ question, "The weekly diaries and/or homework exercises were important to my progress throughout the HLM-ABC program."

Positive feedback. The majority of participants (*n* = 10) acknowledged in their post-treatment interviews that they *benefited from the homework*. One participant explained,

> The exercises … although they were a bit time consuming, like I do think they are important because if you don't sit down and think about it, and apply what you are learning, yeah, you're not going to get anything out of it. So, I think they are valuable, it's just the nature, it's just the nature of the program, right? You have to put the effort in to get something out of it. (P17)

In particular, a number of the participants described the homework as being *informative and of good quality* (*n* = 3), *relating well to the videos* (i.e., psychoeducational lesson content) (*n* = 2), and *yielding tremendous insight* (*n* = 3).

Negative feedback. Nine participants expressed some criticism or *negative feedback about the homework*, including that the diaries were *onerous* (*n* = 6), and *time consuming* (*n* = 2). Four participants reported *feeling pressured to complete the homework* and "guilty" (P02) if they did not. Two participants expressed *difficulty tracking their emotions*, specifically. In one woman's words:

> at a couple points, I felt overwhelmed with it… sitting down and actually putting down your feelings about it all is a little daunting sometimes. You don't want to. Or you just, you know, I don't know what to say about this. So, on Sunday night, and I don't want to do this.

Acceptability of the group element. All 14 participants provided a rating to the question, "The weekly discussion board was important to my progress through the HLM-ABC program," from 1 (strongly disagree) to 5 (strongly agree). The average rating for this item was 3.36 out of 5 (*SD* = 0.28), whereby 36% of participants indicated that they "strongly agreed" or "agreed" (see Figure 8). Forty-three percent indicated that they "neither agreed nor disagreed," 14% indicated that they "disagreed," and a single participant indicated that they "strongly disagreed." The women who disagreed or strongly disagreed elaborated, "Didn`t find I used as much as I could have; I like to put face to person" (P07), "Wasn`t connected to anyone - their

concerns weren`t mine" (P10), and "Did not feel it helped me progress and caused anxiety" (P15).

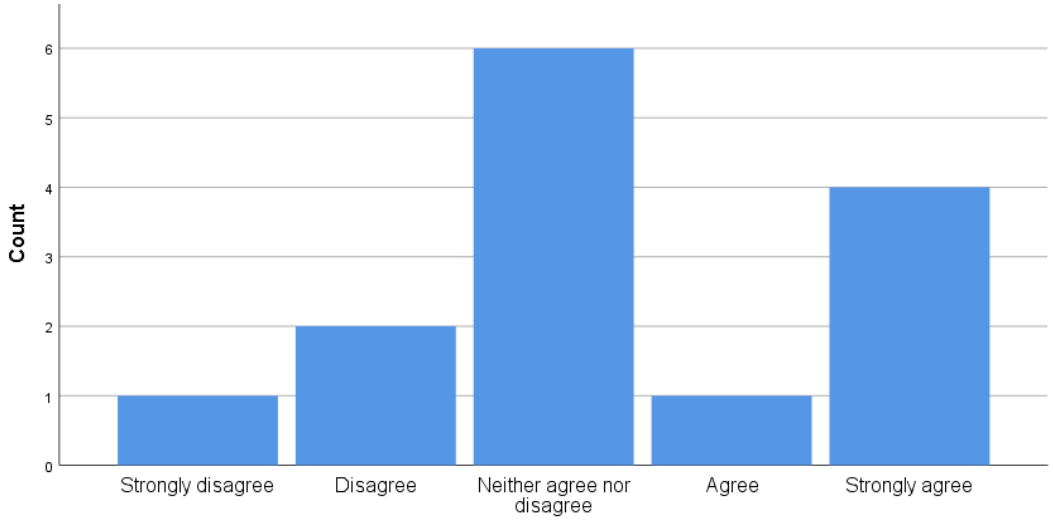

Figure 8. Simple bar count of responses to TSQ question, "The weekly discussion board was important to my progress throughout the HLM-ABC program."

During the PTIs, participants were asked about their experience having participated in the program as part of a group with other women, as opposed to doing so one-on-one with a facilitator online. Ten women provided feedback to this question, half (n = 5) of whom indicated a *preference for a group format*, and three of whom expressed *a desire for greater personal familiarization* (i.e., through visual identification more personal disclosure), even if it meant sacrificing their anonymity, and that in the absence of such opportunities, they would prefer a one-on-one format. Two participants (20%) indicated *no preference* between group versus one-on-one format.

Positive feedback. The qualitative themes that emerged from the PTI data provide further insight and context for understanding how the group element (i.e., DB) was evaluated by participants. Ten group members described benefiting from the DB in a number of ways. The most commonly reported benefit of this interactive feature was its function to *decrease feelings*

of isolation and increase a sense of relatability (*n* = 7). One participant explained it as such:

> I think each of us read each other's submissions, and for me, that was really nice to just hear… not nice, but it, it was necessary to hear what other women are going through and realize wow it's not just me, I'm not the only one who's been struggling here all these years with my wellness, all these women are struggling. So it just validates what you have been going through and it makes you realize you're not alone, and so even though we didn't communicate so much back and forth with each other, we read each other's posts and, I think that felt good (P06).

One woman spoke particularly of the high reward (and bravery involved) of disclosing personal or intimate experiences with one another on the DB: "there were some women that shared some things that I thought were very impactful and it was very, like I appreciated it. And I made sure to let them know" (P19). Interestingly, two women reflected that they felt sufficiently connected with the women via the DB, but noted that this was in the context of receiving additional in-person peer support elsewhere.

Another benefit of the DB was that it *afforded different perspectives and vicarious learning* (*n* = 3). For example, one lady explained, "I guess just hearing about what other people had as barriers and like during their week and what was hard for them … But if it were just you, you wouldn't really know" (P15). Another stated, "we'd get the perspective of other people and how they were applying it. And how they were interpreting it. So, I think it was valuable" (P17). The DB was also considered beneficial as 2) *a means of self-reflection and consolidation of the material* (*n* = 3). In the words of one participant, "it allowed you to take that information that you were providing in the videos and verbalize it, or interpret it and verbalize it to others... how you were applying it" (P17). Finally, the participants reported that the DB was helpful in terms of it being 4) *an opportunity to exchange knowledge of breast cancer resources* (*n* = 2)**.**

Neutral feedback. Some (*n* = 3) participants described more neutral perceptions of the DB. These participants appreciated that they went through the program alongside other women

who could relate to their situation but did not feel that this element added significantly to the overall benefit of the program. For instance, one woman commented:

> I guess maybe there was something nice about other people doing it. That was, I think, you know, a good aspect. And then, on the other hand, I think, it wasn't that important to me. And I also don't think that the group really gelled and really commented or was sort of helpful to each other on the whole (P16).

Negative feedback. Of the participants who provided more negative feedback regarding the DB (n = 6), they indicated that *posting felt like an obligation rather than a desirable activity* (n = 2), wherein "everybody would comment on them, and then that would create more questions and more answers. It was never ending" (P10). One participant merely indicated that *they did not find their peers' comments to be helpful*, but rather "just sort of there" (P15). Finally, the most commonly reported dissatisfaction with the DB was *a low level of interaction and established connection amongst the group members* (n = 5). The feedback conveyed that posts were perceived as disjointed and typically responded to by the facilitators, rather than conversationally amongst group members, themselves. One participant explained, "I don`t think we were that active, as far as the posts. But again, I would add a few now and again and then I didn't feel like it was…I feel like I was typing to, you know, a wall" (P17). Another stated, "the thing about our group though, there wasn't a lot of communication going back and forth, which was, uhm, a little bit disappointing" (P02).

Barriers to group cohesion. A number of themes emerged regarding potential barriers to greater interaction and connection amidst the DB (n = 9). These included participant factors of: 1) *discomfort with the technology* (n = 5) (e.g., "I didn't know how to use [the DB] and I didn't feel comfortable using it…most people are computer savvy so it works for them, but for me it didn't work" [P08].) and 2) *reluctance to disclose/share* (n = 3) (e.g., "maybe because of my personality, I'm not one to like share a lot. So, I think it's just that might have been a barrier for

me" [P15].). Intervention-specific factors that were perceived as impeding group cohesion included 3) *too few group members* (*n* = 4) (exclusively describing the first cohort, which had five participants), and 4) *facilitator redirection that deterred participants from disclosing more personal information* (*n* = 3). One participant from the first cohort (P04) explained:

> there was some kind of comment early on about not, you know, something written about the kind of comments we should make. And maybe that that was limiting to people. You know that they didn't feel like they should comment on somebody else's comments… I think it was you know, that not to be critical or…to not to give advice to other people. And maybe that stopped other people from interacting more.

Another woman (P16), from the second cohort, said:

> Right near the beginning, like when everyone introduced themselves, there was, if someone mentioned that they were going for reconstruction, and you know, I asked about that, and it was made pretty clear that that was not the idea of the discussion board. So, you know, I think that… if that had, you know, been more allowed, like some people's experience, not pertaining to the weight loss, it might have felt more community-wise.

Facilitators made deliberate efforts to contain DB conversation to intervention-specific concepts and experiences and to limit disclosure of potentially upsetting (i.e., medical) information in order to minimize the risk of participants becoming unduly distressed in the physical absence of professional support. It seems that this clinical process had the unintended effect of creating hesitance or confusion in participants about what was welcome and appropriate to share.

Finally, 5) *excessive anonymity and impersonal online member presence* (*n* = 9) was considered a significant barrier to the group members familiarizing and connecting with one another. One woman reported, "I never felt like [a] group of women, because like I said, they were just first names on a page, so I never…felt part of a group. I felt part of a trial with these women, I never felt the bond" (P07). Another participant stated, "I realize for the purpose of the study that there has to be privacy but not seeing a face and not seeing a personality…you know

what I mean? It was, I think, very impersonal, the platform" (P11).

Suggestions for enhancing group cohesion. Participants offered a number of suggestions regarding how to enhance interaction and cohesion amidst members. A number of participants (n = 9) suggested that there be 1) *an opportunity for a visual meeting*, either in-person or via video conferencing, would have increased their sense of connection and thus engagement with one another. One woman (P06) shared:

> I wonder if it would have been nice if the whole group met together, first, and then we were online, we would have had a face to each name…maybe people would have written back and forth with each [other more] had it happened. I don't know, because I think [the facilitators] wanted that to happen, for there to be discussion back and forth with each other, for me to write to one of the other women, 'I know how you are feeling, I have an idea for you' or something like that… maybe if there was that human contact once, it might have happened… it might have also been nice to *see* that these people are struggling like you—so not only to read it, but to actually see the group and then go off on your own.

Another woman (P07) explained how the opportunity for visual identification might have enhanced empathy amidst group members:

> I just think it would have, been more personable like you know, just you talk and if you see the eyes and see the emotions and you feel the feelings. So like I said, when you meet the people, when they`re telling something you can, you might not know them that well, but you see them and you have had a kind of brief meeting so you can see, see their eyes, you can see the pain the joy the whatever. Just by that initial meeting.

The following participant (P13) spoke of the benefits of potential meetings being conducted remotely, through use of video technology:

> I wanted to do the online version. Just because [I'm] busy and you know… I like the idea of it being available to people in small towns…but if there would be a way—okay, what if on the first week, you had a group Skype call, say? Where you saw people? People could just introduce themselves at whatever level they wanted to, you know. And then you did the introductory material, and went on with the program. Yeah, it would be interesting to know if that would be enough?

One woman made the suggestion to present group members with options that would allow for greater choice regarding anonymity, depending on personal preference and comfort:

> You know what, I think that there's pros and cons to [having a visual meeting]… it was online, so there's definite pros to that because you can reach people who live further away. But I think sometimes with the whole group thing, I mean there are people, I think, that do want to remain somewhat anonymous. So in face-to-face, they might not be comfortable with themselves and their body or sharing…Everybody's different, some people might just be reserved, and that's fine, but I think there almost needs to be that happy medium. I think there is a way to do it at a happy medium, through different things. So if people are comfortable with showing their face and they're comfortable with sharing things, whether you do it in person or whether you do that through something like [a teleconference software]… But then there's other things that you could use such as [text-only communication with the option of a personal Avatar, similar to the Moodle platform that was used] (P11).

Other participants (n = 3) encouraged 3) *greater opportunity for familiarization with one another*, for example, by sharing greater personal details that would allow group members to "feel the personality of the other people" and get "a sense of, these are the women who are living life like me" (P13). Another suggested way to familiarize with one another was through 'icebreaker' kinds of exercises:

> Maybe have a, I don't know, come up with a sort of topic other than, like the hardcore program? Something a little more fun, just to ask the group to post or something that would be fun, that would it make a little lighter?... Throw things in throughout the program, you know, 'hey, this is, you know, it's Halloween I want to hear about what everybody's dressing up as.' Or 'if you could dress up as your favorite food what would it be?' You know, something kind of cute like that (P10).

Another suggestion, voiced by two participants, was to 2) *ensure groups have an adequate number of members*. One participant from the first cohort of five members, stated, "we didn't have a large group, and it is always possible that that was, it is just numbers; that you need a certain number to get that kind of thing going" (P04). This was in contrast, to a participant from the second cohort of nine members, who said, "I think having lots of group members made it easier to relate" (P14).

Finally, a single participant suggested that 4) *future groups be more stratified*, according to additional commonalities beyond a history of BC and a desire to live a healthier lifestyle:

> Even though we're all in the same boat, I think our experiences are all very different and I think also the difference—I think what would have been better for me would've been if the women would have been more…instead of having like so many different women of different ages and at different points in their life, to have grouped women together that have more in common; that are at the same kind of stage in life, or age, or even type of breast cancer, because I feel like there's so many different kinds… I think that it shouldn't be that way, but I think there is a bit of…it is different for women that, let's say, had a double mastectomy or a mastectomy, as opposed to a lumpectomy or women that are on a certain kind of medication than women that are on aromatase [inhibitors]. It's different. I would have liked more women that maybe were at the same stage in life that I am…because I think there were some women that maybe were much older, had maybe retired, or seniors, and then there was maybe…other girls who were maybe younger, maybe single and without partners or children. Like I think it all makes a difference (P19).

Acceptability of the facilitators/facilitation. All fourteen participants provided a rating on the TSQ for the question, "The role of the facilitators is a necessary component of this program" (see Figure 9). The average rating for this item was 4.86 out of 5 (*SD* = 0.36), whereby 100% of participants indicated that they "strongly agreed" or "agreed". Participant comments included, "Absolutely, as participants we looked for the direction and learning (or re-direction)" (P04) and, "In our group, there would have been little use of the discussion board without the encouragement of the facilitators. They moved the program forward" (P11). Another participant elaborated, "Won't work without facilitators" (P18).

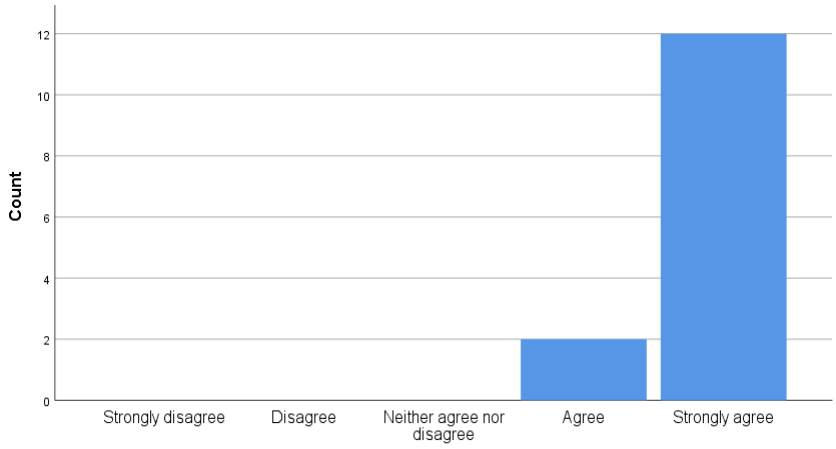

Figure 9. Simple bar count of responses to TSQ question "The role of the facilitators is a necessary component of this program."

Participants also provided a rating for the question, "The total amount of interaction (i.e., online and phone contact) with the facilitators was sufficient" (see Figure 10). The average rating for this item was 4.07 out of 5 (*SD* = 0.83), whereby 86% of participants indicated that they "strongly agreed" or "agreed." Of the two women who were relatively less satisfied with the involvement of the facilitators, one elaborated, "Would have liked more phone interactions" (P15), and the other, "Phone call in the middle was extremely helpful. Would have liked more, but realize time limitations of the leaders" (P16). One participant stated in her PTI, "I'm not sure that there's much more they could do, I mean, they were speaking on the discussion board, they provided the videos, you could email them, and they provided the feedback, so, I think their involvement was good" (P17).

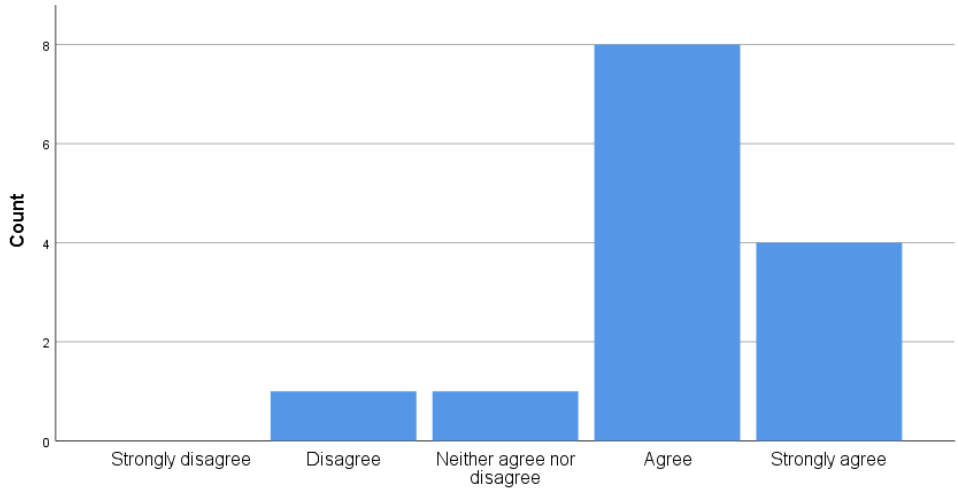

Figure 10. Simple bar count of responses to TSQ question, "The total amount of interaction (i.e., online and phone contact) with the facilitators was sufficient".

All participants provided a rating to the question, "The homework feedback I received from the facilitators was important to my progress through the HLM-ABC program" (see Figure 11). The average rating for this item was 4.21 out of 5 (*SD* = 0.80), whereby 79% of participants indicated that they "strongly agreed" or "agreed". Of the women who "strongly agreed," one elaborated, that it "felt that someone else was also thinking about my situation and issues" (P16). Another stated, "It was great to feel like you were doing the work for a reason and that someone was also taking the time to review it" (P14). The PTI data converge with this finding that the facilitators' feedback was valued, based on the emergent theme that it was experienced as a "gift." For example, one participant stated, "the feedback from [the facilitators], I thought that… they were very perceptive, very generous with their feedback. They were very insightful and I thought that was quite helpful…the amount of feedback they gave, the depth of their feedback was far beyond whatever anticipated…and much more generous, than I, I mean it was, it just felt incredibly, it felt like a gift" (P04).

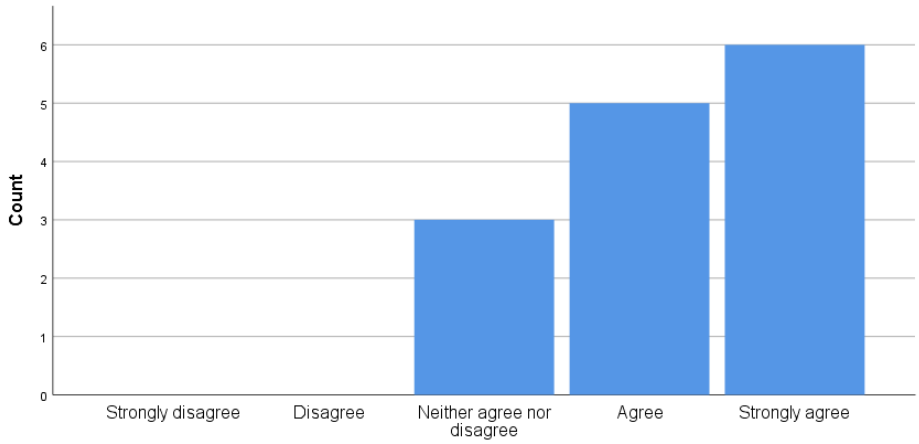

Figure 11. Simple bar count of responses to TSQ question, "The homework feedback I received from the facilitators was important to my progress through the HLM-ABC program."

Especially competent. The qualitative data from the PTIs revealed a number of findings regarding group members' perceptions of the facilitators. Firstly, participants (n = 11) described the facilitators as being *especially competent*. In addition to enjoying having a "professional opinion" (P08), one woman explained, "sometimes can get professional help that isn't so great… you know, so, [while] all professionals are professional, like I just think they were very, very competent" (P16). It seems that the facilitators made this impression by delivering "very helpful and clear" (P02) knowledge, both in their delivery of the weekly education content as well as their dynamic responses on the discussion board and personalized, private homework feedback. For instance, one participant shared that she found the facilitators' discussion posts to be "very meaningful and… showed a lot of understanding and compassion" (P11). Another woman highlighted the special quality of the facilitators' skill, to the extent that she wondered whether this would be generalizable to other iterations of the group:

> I think that it was rare opportunity to have [names of the co-facilitators] because if someone else was running the group I don't think we would have gotten the kind of insights from, you know, the, the, people running it that they provided. I don't know that that's replicable (P04).

Involvement valued. The second theme that emerged from the PTI data was that the facilitators' *involvement was valued* (n = 10). The majority of participants who contributed to this theme (n = 6) described the degree of interaction from the facilitators as being "*just right*" (P04). One group member stated, "I don't know how they could have done more to be honest. And I don't know how they could have done less and [still] made it successful" (P07). Another group member said:

> They were involved enough but not past the point of like they commented on everything we said. You know, like they were there and they were present but they didn't kind of—and the way that they interacted was more like valuing or supporting what was said…more of a positive feedback to help you grow your own assumptions versus 'you're doing it wrong, you should do it this way.' I think they were involved enough that you felt that they were present but they weren't so involved that you felt like you were looking to them for affirmation every time, if that makes sense (P14).

Three participants spoke about the *degree of investment from the facilitators being apparent*. For example, one woman stated, "there's a lot of time and effort, you could tell, put into the program" (P10). Another expressed,

> I think they went above and beyond…they were both great. Yeah. Especially [one of the facilitators]… I was thinking, 'do you sleep or do you work all the time?' Because it was evenings, Sundays, Saturdays, you know, whatever. Pretty committed (P18).

Two of the participants specifically expressed appreciation for the phone "check-ins" (P15, P18) they received from one of the facilitators (DM) intermittently throughout the program (i.e., for the purposes of the intake interview, technological assistance as needed, and planned mid-way call for the second cohort). One woman explained that "the one-on-one really helped you and encouraged you… that's a big thing, you have an actual person…that makes a huge difference" (P18).

Four participants expressed a *desire for more involvement from the facilitators*; however, there were two different reasons for such. The first reason, expressed by three of the group

members, was that the facilitators' involvement was so helpful that "the more, the merrier" (P16). One woman stated,

> I was like a sponge, I would say, with whatever they said. Whatever they said, whatever they typed, I found that I was just—I read it, I reread it… and I thought. Now in retrospect, that's what I mean, like I wish I had been on [the discussion board] every single day in the hopes of getting something [back from the facilitators]…I took it as just like a really good opportunity. So yeah, the more the better (P19).

The second reason for wanting more interaction from the facilitators, expressed by just one participant (P15), was that she felt there was insufficient phone contact and direction from the facilitators throughout the program. This woman stated:

> I thought it would have been more helpful just to have like more check-ins…every couple of weeks type thing…I…needed more direction. Because like I was trying to do my best at putting everything down and really analyzing why I was eating and trying to be more active, but then I needed somebody to push me, to make sure I didn't eat that bag of chips…So I think for me, I just needed a bit more direction and, 'how are you doing?' and 'what was bad?' so that I was more accountable. I think I just was accountable to myself.

This woman also explained that she would have benefited from more contact and support over the phone during the week when body image was covered, which she found "very, very difficult." She explained, "I spoke with [one of the facilitators] on the phone a few times. Like she was very, very helpful…but I just needed more of her calls.

Engaging. The third theme that emerged from the PTIs regarding acceptability of the facilitators was that they were *engaging* (n = 12). According to the group members' feedback, there were a number of specifics things the facilitators did throughout the program to be engaging. Firstly, the facilitators were perceived as being *approachable* (n = 2). Secondly, a number of group members (n = 3) described the facilitators as being *supportive and validating*. For instance, one woman stated,

> …we had a really great conversation on the phone that helped to really kind of validate how I was thinking and what I was learning and, like I said, that was actually quite nice.

> So, I mean, [the facilitator] was just really instrumental to kind of validate that and make me feel like—kind of like what you're doing, 'that was courageous and that's the right thing to do for you…' So that was really, really great. (P11)

Another woman shared, "I've personally benefited from [one facilitator] taking the time to hear my experience and see me as a whole person rather than just the diet part, you know, just the healthy lifestyle study. I have really appreciated that" (P13).

The third broad way in which facilitators engaged participants was through their *human presence* (n = 4), specifically their voice, which seemed to 'humanize' the online intervention. The two opportunities for the facilitators to engage participants through vocal communication were through the standard weekly psychoeducational videos, as well as through individual phone calls. One group member stated:

> [One of the facilitators] and I had done an interview call…so I felt like… I knew her or she knew me (laughter). So yeah, we've spoken several times on the phone and so I definitely felt, you know, that I knew someone who was leading the program. [The other facilitator], I heard just at the beginning of the videos… and that was it. But I didn't feel disconnected at all, it did feel like we were all sort of connected and her voice was on the video (P06).

Another group member described:

> [The facilitators] did the videos. I kind of got a chuckle because you could tell when, like it was their first run, and they did miss something…I like the videos because they were—it was a person. You know, like there were a bit of blips in it. And that's human. So that brought the human aspect. (P07)

An engaging facilitator technique that was noted by three of the participants was that of *presenting questions and alternative perspectives.* Examples of such included "questions [on the discussion board] for you that you could comment on and reflect on in your discussion" (P17) as well as comments such as "could it be because…?" (P07). This input was described as being helpful as a way "to check we were paying attention" (P07) and also to reframe difficulties encountered and validate ongoing efforts in spite of such (e.g., "I should be in this program and

whether or not I lose weight out of this, I'm still getting something from it and I think I'm still contributing to the program" (P11).

It was clear to several (n = 4) of the participants that the facilitators were not only trying to engage group members individually, but were also *striving to promote greater interaction directly between the group members themselves*. For example, one woman expressed:

> I think [the facilitator] wanted that to happen, for there to be discussion back and forth with each other. For me to write to one of the other women, 'I know how you are feeling. I have an idea for you' or something like that. Or, 'I went through that too, don't feel bad,' or, 'I'm struggling with that too.' I think she wanted that. Maybe if there was that human contact once [between group members] it might have happened (P06).

Another group member shared, "I think they kind of kept the discussion boards going… I didn't find my group had a lot…of discussion on the discussion board. I feel like [the facilitators] did their best to get it going. Which was appreciated…" (P07).

Another way the facilitators seemed to engage the group members was through the *ongoing provision of individualized feedback* (n = 4). For example, one woman (P14) explained:

> I really liked getting the feedback. I think it made doing the homework worthwhile and prioritizing it because the thing is, if you're just doing something and you never hear any feedback about it, it doesn't really make you want to do it, right?... I think it was a good balance between the online—which was a lot more the discussion board—which was a lot more general feedback, and it kind of came from [both facilitators] but also the other group members, to then have also that individual piece. I think it was a good contrast too.

The final way in which the facilitators engaged the group members was by *helping them "get back on track when [they] had fallen off"* (P15) (i.e., use of MI) (n = 4). One woman (P08) explained how this form of support helped her decide to continue participating in the program when she felt the urge to disengage:

> …actually [one of the facilitators] helped me stay on it because I was going to quit. Because I got frustrated with it and she sort of talked me through it and I decided to stay on for the program… I'm a quitter and [the facilitator] helped me through that.

Another woman (P11) described that by helping her confront and explore an underlying barrier to change and connect with her values, an MI conversation with the facilitator not only kept her engaged in the HLM-ABC intervention, but helped her make a greater commitment to self-care:

> I know better but I don't always do better when it comes to myself, because I prioritize myself behind everything else that needs to get done. And the big thing for me was work and I hit a crossroads where the homework was actually becoming overwhelming for me and it's not a whole lot of homework but the fact that I had to do it and the fact that the 'drill sergeant' in me was like, "well you know, you're not doing it, you're failing"—I hit a crossroads. And I actually had a conversation with [the facilitator] where I felt like, "I don't know if I can do this. I think I might need to pull myself out because it's not going to be fair to you and your program." And I kind of…realized, "Wait a minute, but that's the thing about this program—it's going to help…to figure out, you know, what about hard points? Like what are the turning points for people? What works and what doesn't work?" So, the thing for me was that I hit a wall with that whole self-care thing. We had a really great conversation about it and I've never dealt with kind of that turning point. I made a decision, I followed my doctor's recommendation, I made a decision to take a leave of absence from work, which was really hard to do but I know that it was a huge act of self-love…So I was dedicating way too much of myself to work and my other responsibilities versus myself.

Responsive and accommodating. The final theme that emerged from the PTIs was that the facilitators were experienced as being *responsive and accommodating* (n = 9) to the group members. The first way the participants described the facilitators as being such was in terms of their *attunement to and acknowledgement of group member inactivity* (n = 4). For instance, one woman (P06) explained:

> Several times [one of the facilitators] wrote to me and said "I haven't seen anything from you, are you okay?" and then I wrote back, "I'm away, I'm in London," and that kind of thing. So she was right on top of you in the sense that she was worried if you weren't online for several days.

Another woman shared, "It was great. Checking in, following up, like I found all of those things were really great. Especially like if for some reason the homework wasn't submitted or

some days I wasn't online or whatever. I appreciated the follow up" (P14).

Another way the facilitators were described as being responsive was in the way they were perceived as being *available to help with any difficulties encountered* (*n* = 9). A common challenge involved technical difficulties submitting homework assignments online, for which the facilitator worked with participants to come up with creative and flexible solutions (e.g., faxing hardcopy materials, taking pictures of hardcopy materials with one's smartphone and uploading to the Moodle@York website or emailing directly to the facilitator). Another unanticipated technical challenge the group members encountered was difficulty locating their private homework feedback from the facilitators on the Moodle@York platform. Once this problem was identified, the facilitators were perceived as being reactive: "[the facilitator] was really good about emailing everyone and saying 'make sure you, that everybody, is checking for their feedback and where it was.' So she did let us know that we needed to look for it" (P15).

One group member (P11) described feeling "overwhelmed" with the amount of homework assigned. In response to this challenge, she explained, "[the facilitator] was great, and she said, 'Listen, you could give me two worksheets, but just pick one or the other.' So, it wasn't so much about being compliant, just to get homework in."

The final way facilitators were described as being responsive, was in terms of *providing emotional support as needed* (*n* = 3), either directly or by making appropriate referrals for additional support as needed. One woman (P19) described her experience of feeling emotionally confronted and uncomfortable through the program, but ultimately safe and enlightened because she was accompanied through this sensitive process by a skilled professional:

> I think things come up because you learn about yourself and so there are things that are just not very nice…they did for me during, and I felt so grateful that I had [the facilitators] to bounce [ideas off of]… When things come up, it can be hard if you're processing it alone…It's like, wow. If you've never been exposed to that [kind of

> support], you don't even know that you like that or you don't even know that you need that. So then you're like, "oh I really"—you just get a little taste and then you're like, "oh gosh it's not enough…" For me, I felt like I had been gifted something. It was like, I'm not going to waste it [laughs]…I'm going to try to really take advantage of [the support]. But it does kind of open up some things though. Yeah, I would say that I developed—yeah there was points where I was very anxious throughout [short pause]. So, yeah, it is a bit difficult.

Acceptability of the online 'Moodle@York' platform. All 14 participants provided ratings from 1 (strongly disagree) to 5 (strongly agree) to a number of questions regarding their experience of the program website (Moodle@York) on the TSQ. In response to the first question, "I thought the website was easy to use," participants provided an average rating of 3.36 out of 5 (*SD* = 1.22), whereby only 36% of participants indicated that they "strongly agreed" or "agreed" and the majority (64%) indicated that they "neither agreed nor disagreed" or "disagreed" (see Figure 12). In response to the question, "I felt very confident using the website," participants provided an average rating of 3.43 out of 5 (*SD* = 1.34), whereby 57% of participants indicated that they "strongly agreed" or "agreed" and 43% indicated that they "disagreed" (see Figure 13).

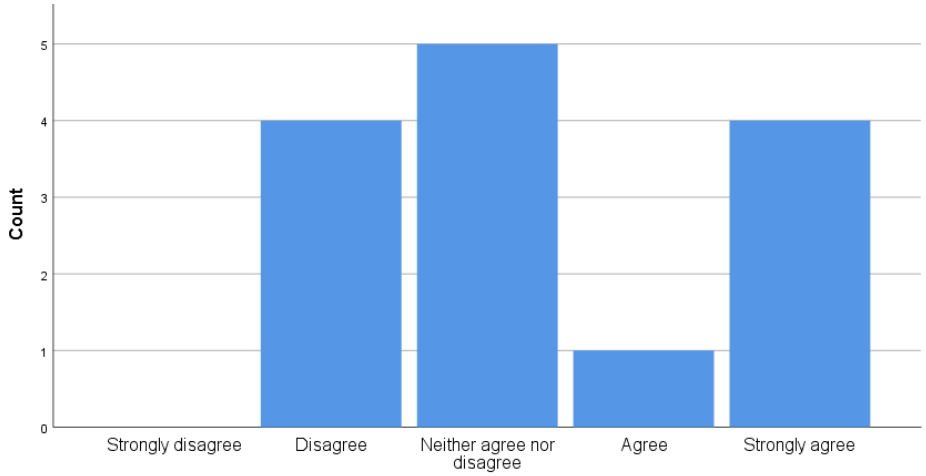

Figure 12. Simple bar count of responses to TSQ question, "I thought the website was easy to use."

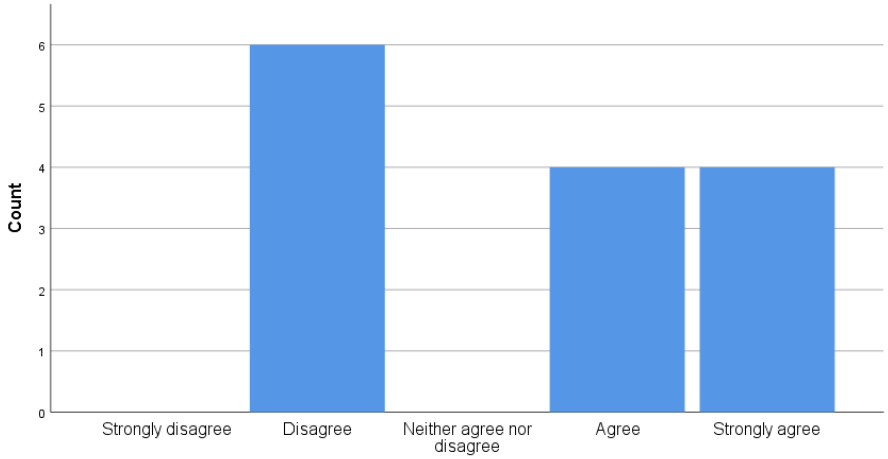

Figure 13. Simple bar count of responses to TSQ question, "I felt very confident using the website."

In response to a question regarding suggestions for how the website could be improved, one participant indicated, "It was sometimes difficult to find previous discussions—a search function might have helped. I also found it a bit difficult to find feedback to homework. It wasn`t intuitive" (P04). Other suggestions included, "Easier to do homework online. Maybe have an app so could use on cell" (P07), and "More modern, user-friendly platform, such as GroupMe or Facebook (one that would also support anonymity)" (P11).

During the PTIs, participants were asked what was it like to take part in an online (versus in-person) program. Eight women provided feedback to this question, five (62.5%) of whom described a preference for an online format, and four (50%) of whom reported a preference for an in-person format greater opportunity to personally familiarize themselves with the other group members (i.e., through visual identification, through greater personal disclosure). One participant (P18) was conflicted on this issue, as she lived remotely and the nearest in-person program was a "three-and-a-half-hour drive" but described herself as being of an older generation and not being "savvy with computers." This participant indicated that she would have preferred a telehealth format, if not for the entire duration of the intervention, for "a couple times throughout."

Accessible. The qualitative themes that emerged from the PTIs provide further insight into the mixed perceptions of the online Moodle@York platform. Nine of the participants (64.29%) described elements of the platform as being *accessible* (*n* = 9). Specifically, the platform was characterized as being generally *user-friendly and easy to navigate* (*n* = 7), and *easily oriented to* (*n* = 7). One participant stated, "even though I am not very techy, I was totally managing it" [P06]). Another expressed, "I had a little trouble finding out where things are... But once you got on to it and used it a few times, it was, it was pretty good, it was pretty user friendly, once you learned where to go, and how to access, or how to input things" (P17).

Inaccessible. The majority of participants endorsed some element of the Moodle@York platform as being *inaccessible* (*n* = 10)**.** In particular, the website was described as being *user-unfriendly* (*n* = 8) in terms of it being "archaic" (P13) and confusing (i.e., not intuitive). One participant stated generally, "I didn't find it a helpful platform. No, I would even push, more strongly, I would say the platform took away from the experience." (P13).

Several participants (*n* = 7) spoke of there being so many steps involved in submitting homework and a lack of clear instructions regarding the same (e.g., having to upload multiple documents one at time, needing to confirm submission after it appeared as though the documents were already submitted) that it often resulted in failed or late submissions. In the words of one participant:

> "… I would just be frustrated. I'd think, 'oh my God, here we go again, this stupid Moodle program ... I didn't have any trouble finding [the homework], didn't have any trouble doing all of that excepting giving it back. I'd lose it, and didn't know where it was, I said, 'something has be better than this'…so it was almost impossible for me, where someone else would just find it an annoyance. But somehow the computer part of it has to be easier (P18).

Another criticism of Moodle@York was that it was *incompatible with portable hand-held devices such as smartphones or tablets* (*n* = 7), and therefore limited program accessibility to a

desktop or laptop computer use only, which was deemed inconvenient. One participant explained,

> …the big thing is I would have liked [if] I could have had access to it. Because when you are going through stuff, even after the cancer you're still in a point where it's a lot [of appointments] and you've got that time where you are sitting and thinking, "you know what, I could be …watching the video and whatever." … my visual was 'oh, this will be great. Sundays I'll watch the videos, I'll get the homework in in the morning and then do my thing and then come home and watch the video', and it didn't necessarily work out that way (P07).

The inability to access the homework from a more portable electronic device was also perceived as a specific hindrance to homework completion (i.e., submitting her food diary) (n = 6). For example, one woman stated:

> It got to me after a while… a lot of times I just guesstimated the timing of it, because I [filled it in at the] end of the day … I wasn't going to walk around with a pad of paper. But I think…if there was an app, and you just kind of made it easy on the phone because then you'd actually fill it in. Like if you have standards…for breakfast you put in the common things, and then it would pop up. You know what I mean? It could be an app and bit more user friendly for people on the go... (P07).

Table 3

Qualitative Themes and Sub-Themes Regarding Acceptability of Program and Components

Category	*n*	*%*
Theme 1: Overall Program Satisfaction		
1.1 Positive feedback	12	86
A new, more balanced, moderate approach to lifestyle change	11	79
Internal (versus external) focus as empowering	11	79
Opportunity to discuss unaddressed issues not otherwise available	10	71
Taught new skills	6	43
Created accountability	4	29
Provided useful knowledge about healthy eating	3	21
Flexible to fit one's individual preferences/lifestyle	3	21
1.2 Mixed feedback	2	14
1.3 Program expectations	12	86
Expectations were met or exceeded	8	57
Expectations were not met	4	29
1.4 Program endorsement	14	100
Would recommend the program to others	10	71
Would recommend with caveat of setting clearer expectations	4	29
Theme 2: Acceptability of Psychoeducational Videos		
2.1 Praises	13	93
Detailed and informative	11	79
Enjoyable	9	64
Nothing missing from content	4	29
Good length	3	21
Easy to watch at own convenience	3	21
Liked the way material is presented	3	21
2.2 Criticisms	5	36
Missing desired information	5	36
Wanted more planning for continued accountability and maintenance	5	36
Wanted more guidance around what to eat	2	14

Wanted information about how to communicate with others about lifestyle choices (i.e., assertiveness skills)	1	7
Slow moving	2	14
Did not like the way material is presented	1	7
Complicated and overwhelming	1	7
2.3 Favourite modules	12	86
Week 5 (Cognitive barriers; "saboteurs")	12	86
Week 6 (Cognitive restructuring; "developing one's "inner coach")	12	86
Week 3 (Eating more consciously and intuitively)	10	71
Week 7 (Getting emotionally aware and practicing self-care)	5	36
Week 4 (Behavioural activation)	2	14
Week 8 (Body image and self-esteem)	1	7
Theme 3: Acceptability of Homework		
3.1 Positive feedback	6	43
Informative and good quality	3	21
Yields tremendous insight	3	21
Relates well to videos	2	14
3.2 Negative feedback	9	64
Onerous and time consuming	6	43
Generated a sense of pressure and guilt if not completed	4	29
Difficult to track emotions	2	14
Theme 4: Acceptability of Group Element		
4.1 Preference of group versus one-on-one format	10	71
Prefer group format over individual format	5	36
Prefer individual format if no options for greater personal familiarization	3	21
No preference	2	14
4.2 Positive feedback about discussion board	10	71
Decreased feelings of isolation and increased feelings of relatability	7	50
Afforded different perspectives and vicarious learning	3	21
Was a means of self-reflection and consolidation of learning	3	21
Opportunity to exchange knowledge of relevant resources	2	14
4.3 Neutral feedback about the discussion board	3	21
4.4 Negative feedback about the discussion board	6	43

Low level of interaction and connection amongst group members	5	36
Posting felt like an obligation	2	14
Comments from others not considered helpful	1	7
4.5 Barriers to group cohesion	9	64
Excessive anonymity and impersonal online member presence	9	64
Discomfort with technology	5	36
Too few group members	4	29
Facilitator redirection deterred from greater personal disclosure	3	21
Reluctance to disclose/share	3	21
4.6 Suggestions for enhancing group cohesion	10	71
Opportunity for a visual meeting (in person or video conference)	9	64
Greater opportunities for familiarization with one another	3	21
Ensure groups have an adequate number of (i.e., more) members	2	14
Further stratify groups based on commonalities	1	7
Theme 5: Acceptability of Facilitators/Facilitation		
5.1 Deemed especially competent	11	79
5.2 Involvement valued	10	71
Interaction ‘just right’	6	43
A desire for more interaction from facilitators	4	29
Investment from facilitators apparent	3	21
5.3 Engaging	12	86
A human presence	4	29
Strived to promote greater interaction between group members	4	29
Provided ongoing individualized feedback	4	29
Helped ‘get back on track’ when they had fallen off	4	29
Presented questions and alternative perspectives	3	21
Supported and validated	3	21
Approachable	2	14
5.4 Responsive and accommodating	9	64
Available to help with difficulties encountered	9	64
Attuned to and acknowledging of group member inactivity	4	29
Provided emotional support as needed	3	21

Theme 6: Acceptability of the Online 'Moodle@York' Platform		
6.1 Accessible	9	64
User-friendly and easy to navigate	7	50
Easily oriented-to	7	50
6.2 Inaccessible	10	71
User-unfriendly	8	57
Incompatible with portable handheld devices	7	50

Note: *n* refers to the number of participants who endorsed each category. % refer to the percentage of participants from the overall sample who endorsed each category.

Research Question 3: Preliminary Effectiveness

A final aim of this study was to determine whether the HLM-ABC intervention demonstrates promise in terms of helping BCSs achieve and maintain greater physical, behavioural, and psychosocial health. This was assessed by comparing quantitative measures of such at baseline to those repeated at post-treatment, 6-month follow-up, and 12-month follow-up, and triangulating these results with participants' qualitative reports of perceived change (summarized in Table 6).

Physical health. The limited-effectiveness of the HLM-ABC intervention program on physical health was assessed by measuring weight, BMI, and waist circumference. Pairwise comparisons were performed for each of the outcome measures at T0 to T1, T2, and T3, to determine preliminary effectiveness of the intervention (see Figures 14, 19, and 20). Effect sizes for each of these values are presented in Table 7.

Weight. Weight (lbs) decreased from pre-intervention (T0) (*M* = 196.65; *SD* = 38.59; range= 159.83-300.49) to post-intervention (T1) (*M*=194.50; *SD* = 35.24; range = 159.39-279.50). This represents a 1.09% reduction in baseline weight and a small effect. Weight did not change from pre-intervention to 6-months follow-up (T2) (*M*=193.63; *SD* = 33.29; range = 157.85-264.55). Weight decreased from pre-intervention to 12-months follow-up (T3)

(*M*=191.29; *SD* = 33.91; range = 156.31-260.15), which is a 2.73% reduction in baseline weight and a small effect.

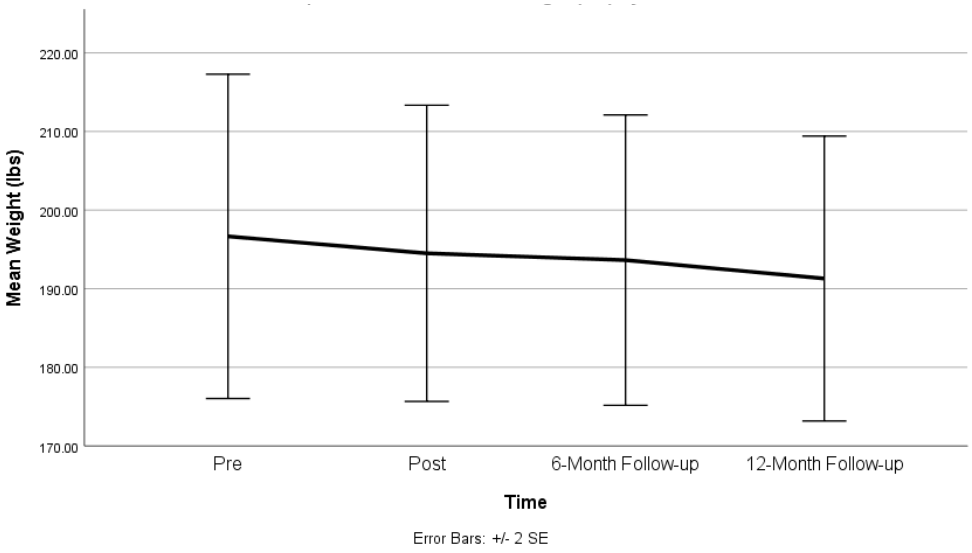

Figure 14. Mean weight (lbs) as a function of time.

In order to explore individual variability within the sample and determine whether this mean trend in weight change is representative of individuals' change trajectories, descriptive statistics, including line charts, were examined for each individual participant across all four time points. Using the recommended guideline in the literature of at least 5% reduction in weight from baseline as the cut-off for clinically-meaningfully weight loss (Swift et al., 2016), this analysis revealed that five participants in this study lost a clinically-significant amount of weight at 12-months follow-up (see Figure 15). Weight loss amongst these participants varied from 9.7 pounds (5.33% reduction in baseline weight) to 40.34 pounds (13.42% reduction in baseline weight) between T1 and T4.

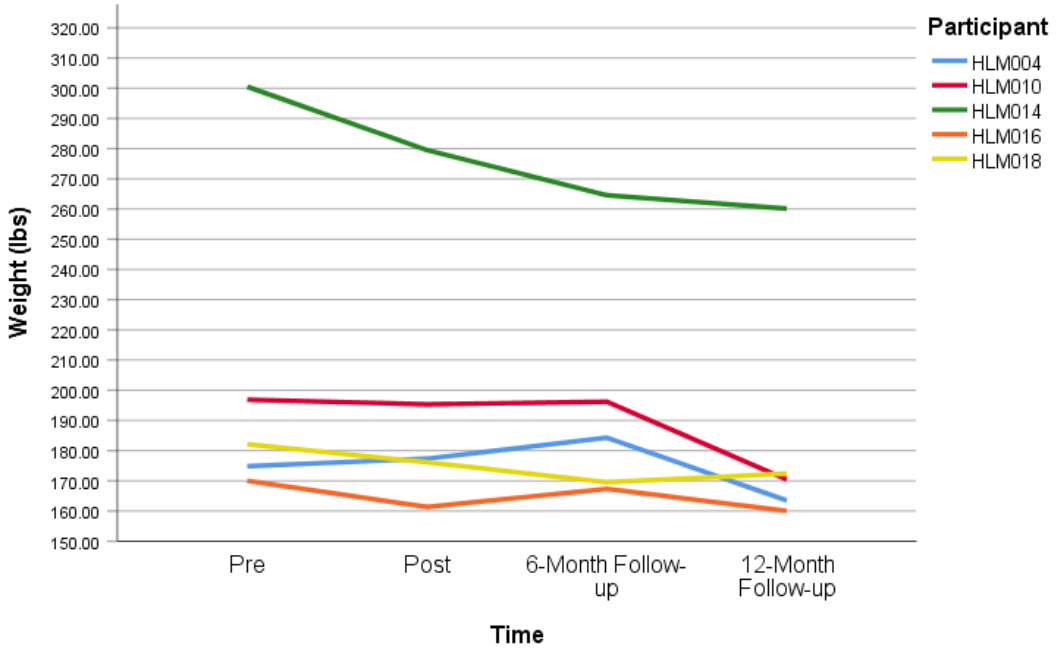

Figure 15. Change in weight, over time, for participants who achieved greater than 5% reduction in body weight between pre-treatment (T0) and 12-months follow-up (T3).

Seven participants showed less than a 5% change in weight (i.e., clinically non-significant change from baseline) (see Figure 16), and two participants gained a clinically-significant amount of weight (i.e., greater than 5% increase in body weight) by 12-months follow-up (Figure 17).

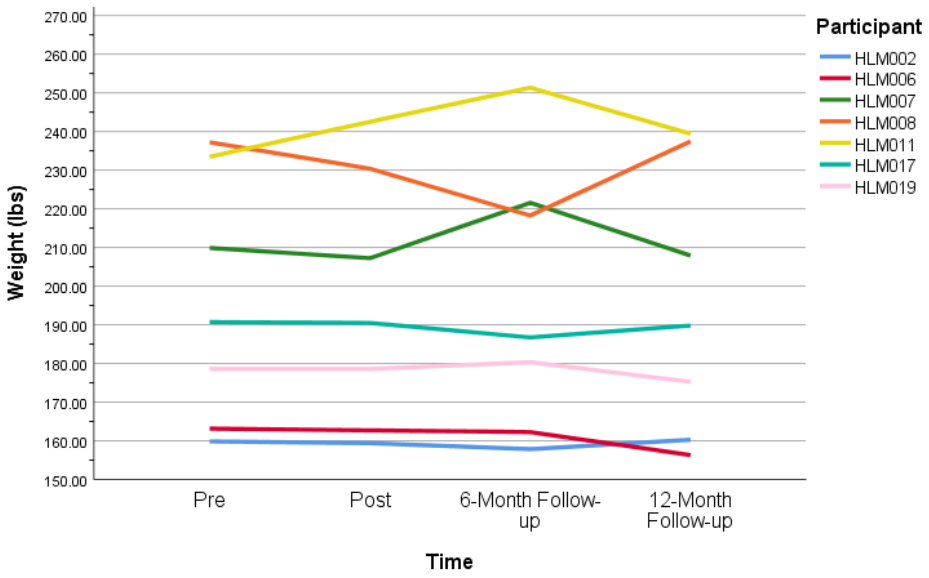

Figure 16. Change in weight, over time, for participants who achieved less than 5% change in body weight between pre-treatment (T0) and 12-months follow-up (T3).

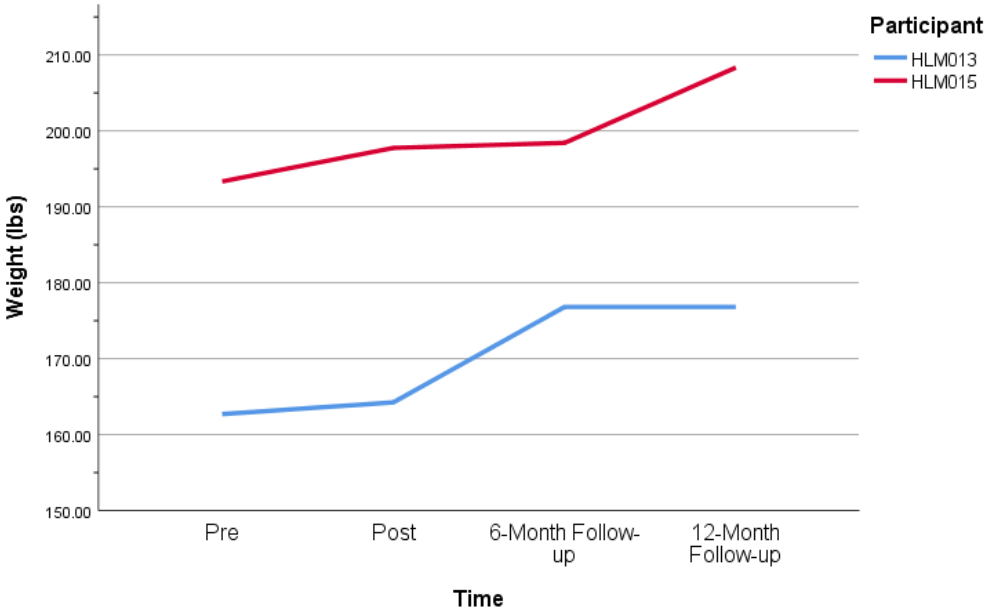

Figure 17. Change in Weight, Over Time, for Participants Who Gained Greater Than 5% Body Weight Between Pre-Treatment (T0) and 12-Months Follow-Up (T3).

Pearson's chi-squared comparisons were conducted to explore the relationships between the dependent variable, weight change (classified as less than 5% change in body weight, 5%

greater reduction in body weight, or 5% or greater increase in body weight between baseline and 12-months follow-up), and a number of independent variables, with significance level set at $p < 0.05$. These independent variables included: group cohort (group 1 or group 2); baseline program expectancy (high [50-67% expected improvement] or low [68% or greater expected improvement]); change in motivation (no change, increase; or decrease from baseline to 12-months follow-up); change in nutrition self-efficacy (no change, increase; or decrease from baseline to 12-months follow-up); change in nutrition self-efficacy (no change, increase; or decrease from baseline to 12-months follow-up); and baseline BMI class (overweight or obese).

In addition, Fisher's exact test was conducted to identify the exact probability that the chi-squared statistics were accurate, given that the data violates the chi-square assumption that the expected frequencies in each cell not be below five (significance level set at $p < 0.05$). Of these analyses, the only significant relationship found was that between variables of change in weight and change in motivation, with Fisher's exact test = 7.94, $p < 0.05$. As can be seen in Figure 18, those participants who experienced a decrease in motivation over the course of the intervention were more likely to have gained weight, those who did not experience a shift in motivation were more likely to also not have experienced a significant change (defined as 5% or more) in weight, and those who experienced an increase in motivation were more likely to have

either lost an insignificant (less than 5%) or significant (5% or greater) amount of weight, but not to have gained weight.

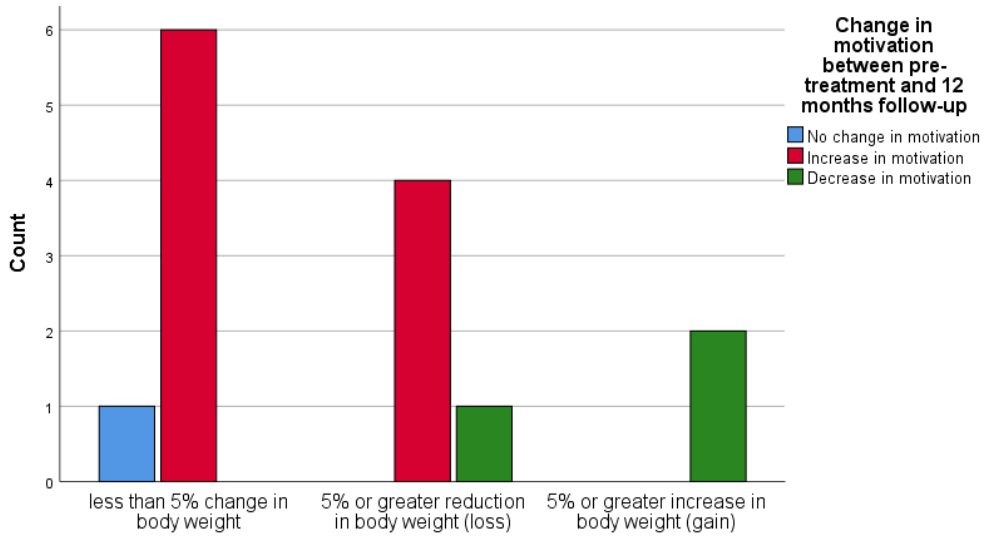

Figure 18. Change in weight between pre-treatment (T0) and 12-months follow-up (T3) as a function of change in motivation between pre-treatment (T0) and 12-months follow-up (T3).

BMI. In addition to change in weight, change in BMI was also assessed over time as another anthropometric outcome measure. Effect sizes for pairwise comparisons are presented in Table 7. BMI decreased minimally from pre-intervention (T0) (*M* = 33.51; *SD* = 5.32; range = 27.82-46.84) to post-intervention (T1) (*M*=33.14; *SD* = 4.75; range = 27.74-43.57). BMI did not change from pre-intervention to 6-months follow-up (T2) (*M*=33.11; *SD* = 4.59; range = 27.54-41.24). BMI decreased from pre-intervention to 12-months follow-up (T3) (*M*=32.62; *SD* = 4.71; range = 26.65-40.55), with five participants moving down a BMI category (four went from 'class I obese' to 'overweight' and one went from class II obese' to 'class I obese'), one participant went up a BMI category from 'overweight' to 'class I obese', and the eight others remained in the same BMI category (two remained 'overweight,' two remained 'class I obese,' three remained 'class II obese,' and one remained 'class III obese').

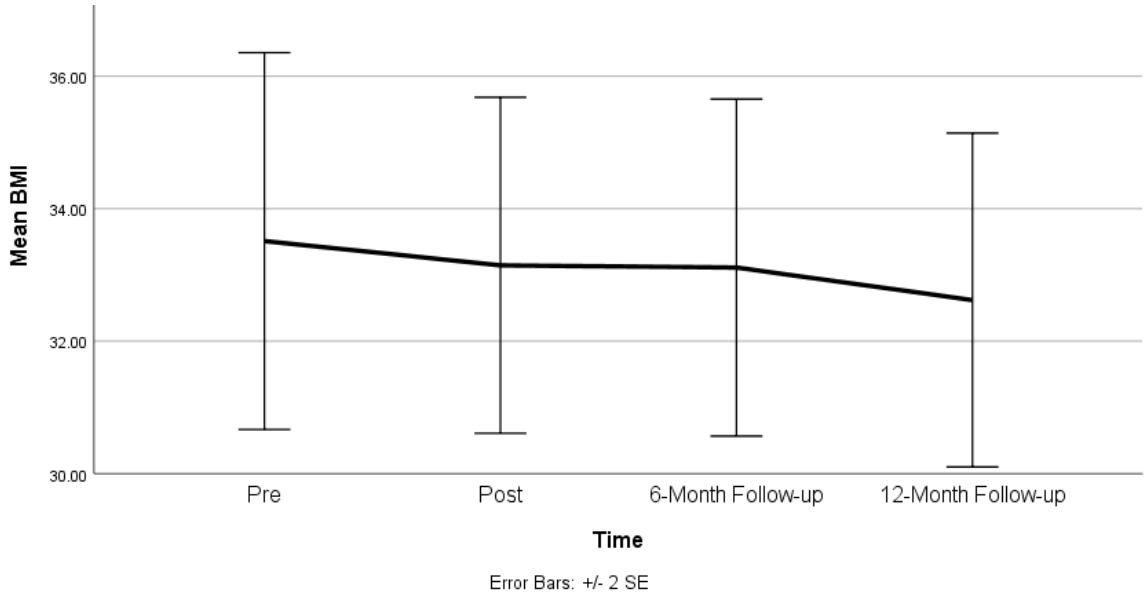

Figure 19. Mean body mass index (BMI) as a function of time.

Waist circumference. Waist circumference (cm) increased from pre-intervention (T0) (*M* = 105.15; *SD* = 11.58; range = 88.00-124.00) to post-intervention (T1) (*M*=105.31; *SD* = 11.61; range = 86.00-124.00), with a small effect. There was essentially no difference in waist circumference from pre-intervention to 6-months follow-up (T2) (*M*=104.18; *SD* = 12.47; range = 84.50-124.46) or from pre-intervention to 12-months follow-up (T3) (*M*=105.58; *SD* = 11.06; range = 91.44-124.46).

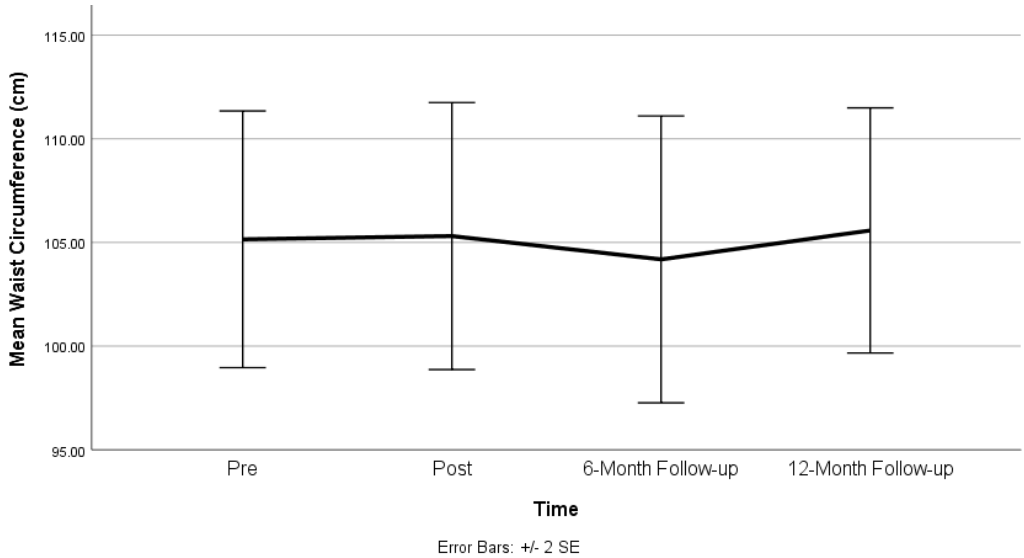

Figure 20. Mean waist circumference (cm) as a function of time.

Table 4

Pairwise Comparisons of Anthropometric Outcome Scores at Baseline (T0) with Post-Treatment (T1), 6-Month Follow-up (T2), and 12-Month Follow- up (T3)

Variable	T0-T1 *d* [95% CI]	T0-T2 *d* [95% CI]	T0-T3 *d* [95% CI]
Weight	0.30+ [-0.48, 1.09]	-0.007 [-0.82, 0.80]	0.37+ [-0.42, 1.15]
BMI	0.32+ [-0.46, 1.10]	-0.019 [-0.83, 0.79]	0.37+ [-0.41, 1.16]
Waist circumference	0.39+ [-0.43, 1.21]	-0.052 [-0.86, 0.76]	-0.073 [-0.85, 0.70]

Note: *d* = Cohen's d; CI = 95% confidence interval; + = small effect, ++ = medium effect.

Behavioural health. Pairwise comparisons of intuitive eating scores (assessed using the IES) and PA scores (assessed using the GLTEQ) were calculated at T0 to T1, T2, and T3 (see Figures 21-26), and effect sizes are presented in Table 8. These quantitative results were triangulated with qualitative descriptions of altered patterns of eating and moving (Table 10).

Eating habits. Intuitive eating, in general (according to the total IES score), increased from pre-intervention (T0) (*M* = 2.90; *SD* =0.61; range = 1.91-4.09) to post-intervention (T1) (*M*=3.25; *SD* = 0.52; range = 2.26-4.22). Intuitive eating also increased from pre-intervention to 6-months follow-up (T2) (*M*=3.28; *SD* = 0.64; range = 2.43-4.52) and from pre-intervention to 12-months follow-up (T3) (*M*=3.25; *SD* = 0.56; range = 2.39-4.30). There were large effect sizes for each of these pairwise comparisons.

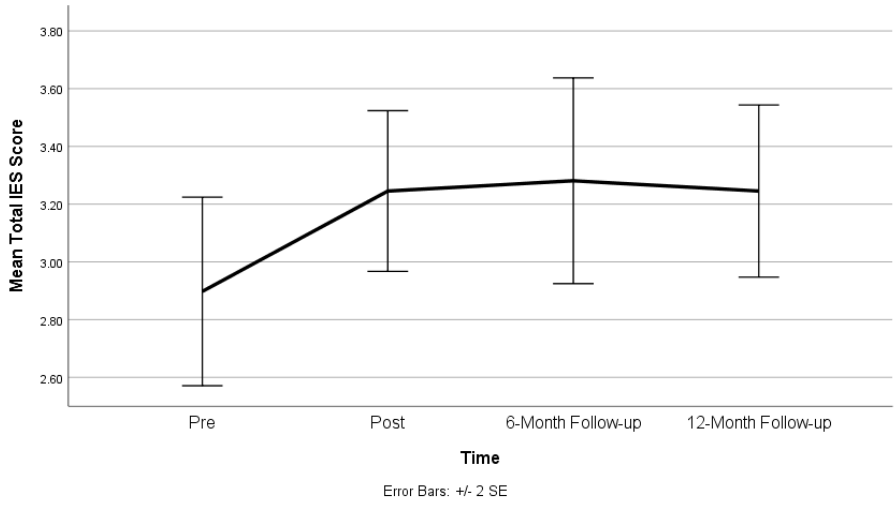

Figure 21. Mean Intuitive Eating Scale (IES) score as a function of time.

The Unconditional Permission to Eat (UPE) subscale of the IES revealed that participants' willingness to eat, rather than restrict, when hungry decreased from pre-intervention (T0) (*M* = 3.43; *SD* =0.51; range = 2.17-4.00) to post-intervention (T1) (*M*=3.05; *SD* = 0.76; range= 1.67-4.67). UPE decreased from pre-intervention to 6-months follow-up (T2) (*M*=3.33; *SD* =0.53; range= 2.50-4.17), as well as from pre-intervention to 12-months follow-up (T3) (*M*=2.76; *SD* = 1.01; range = 1.17-4.33). These represented medium, small, and medium effect sizes, respectively.

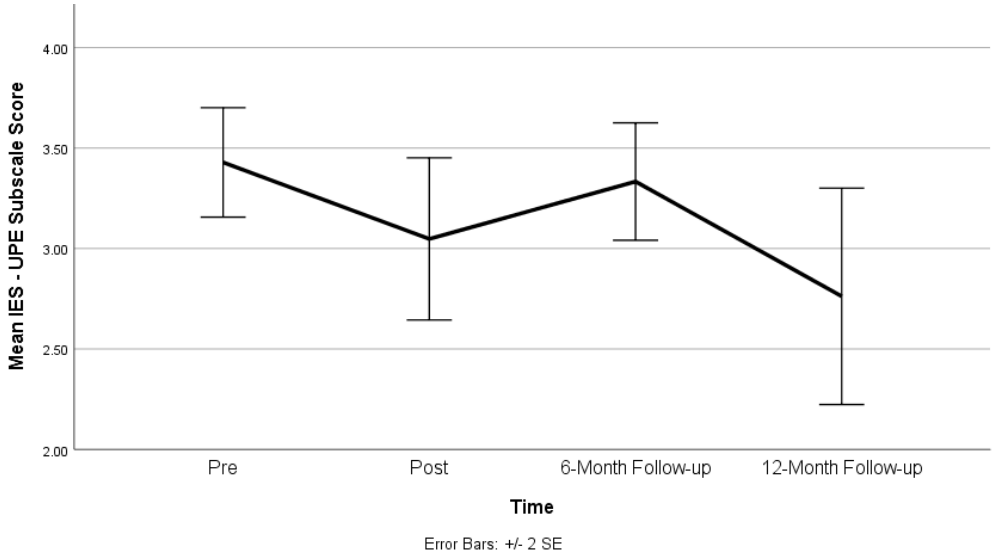

Figure 22. Mean Intuitive Eating Scale (IES) – Unconditional Permission to Eat (UPE)subscale score as a function of time.

The Eating for Physical Rather Than Emotional Reasons (EPR) subscale of the IES revealed that participants' pattern of eating for reasons of hunger rather than to cope with emotional distress increased from pre-intervention (T0) (*M* =2.71; *SD* =1.05; range =1.13-5.00) to post-intervention (T1) (*M* =3.31; *SD* =0.83; range =1.88-5.00). EPR also increased from pre-intervention to 6-months follow-up (T2) (*M* =3.21; *SD* =0.99; range =1.88-5.00) and from pre-intervention to 12-months follow-up (T3) (*M* =3.49; *SD* =0.94; range =1.75-5.00). There were medium, medium, and large effects for each of these pairwise comparisons, respectively.

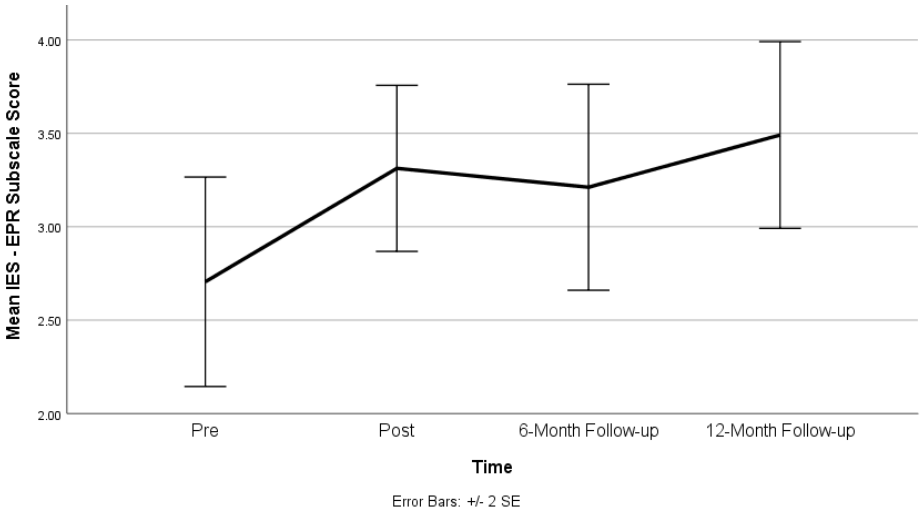

Figure 23. Mean Intuitive Eating Scale (IES) – Eating for Physical Rather Than Emotional Reasons (EPR) subscale score as a function of time.

The Reliance on Hunger and Satiety Cues (RHSC) subscale of the IES revealed that participants' trust in and reliance on internal hunger and satiety cues to guide eating increased from pre-intervention (T0) (*M*=2.57; *SD* =0.69; range =1.83-4.17) to post-intervention (T1) (*M*=3.20; *SD* =0.73; range =2.00-4.33). RHSC also increased from pre-intervention to 6-months follow-up (T2) (*M*=3.28; *SD* =0.80; range =1.17-4.17) and from pre-intervention to 12-months follow-up (T3) (*M* =3.17; *SD* =0.72; range =1.50-4.33). There was a medium effect, a large effect, and a medium effect for these pairwise comparisons.

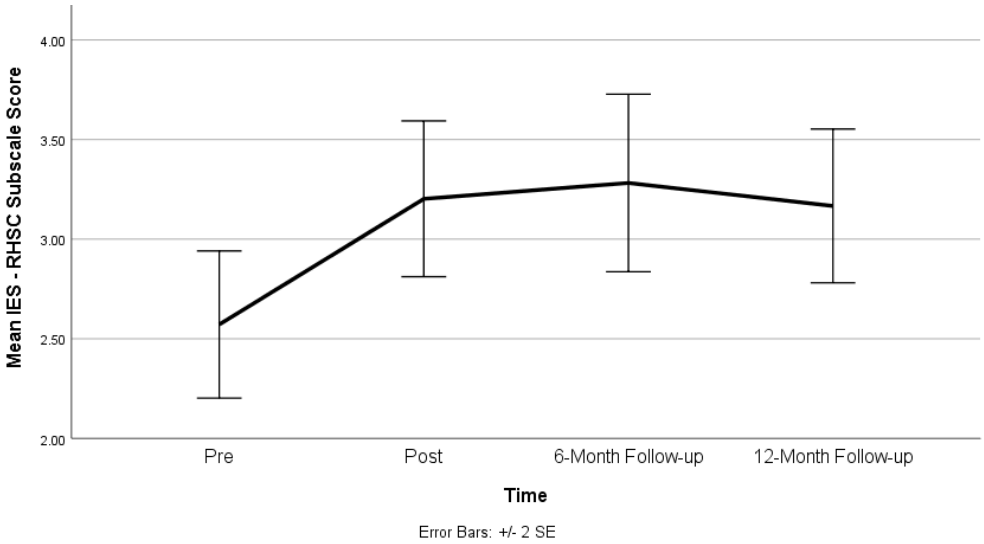

Figure 24. Mean Intuitive Eating Scale (IES) – Reliance on Hunger and Satiety Cues (RHSC) subscale score as a function of time.

The Body-Food Choice Congruence (B-FCC) subscale of the IES revealed that participants' tendency to match their food choices with their body's nutritional needs increased from pre-intervention (T0) (*M* =3.00; *SD* =1.05; range =1.00-4.67) to post-intervention (T1) (*M* =3.55; *SD* =0.88; range =2.00-5.00). B-FCC also increased from pre-intervention to 6-months follow-up (T2) (*M* =3.36; *SD* =1.00; range =2.00-5.00) and from pre-intervention to 12-months follow-up (T3) (*M* =3.71; *SD* =0.83; range =2.00-5.00), with a medium effect, small effect, and medium effect, respectively.

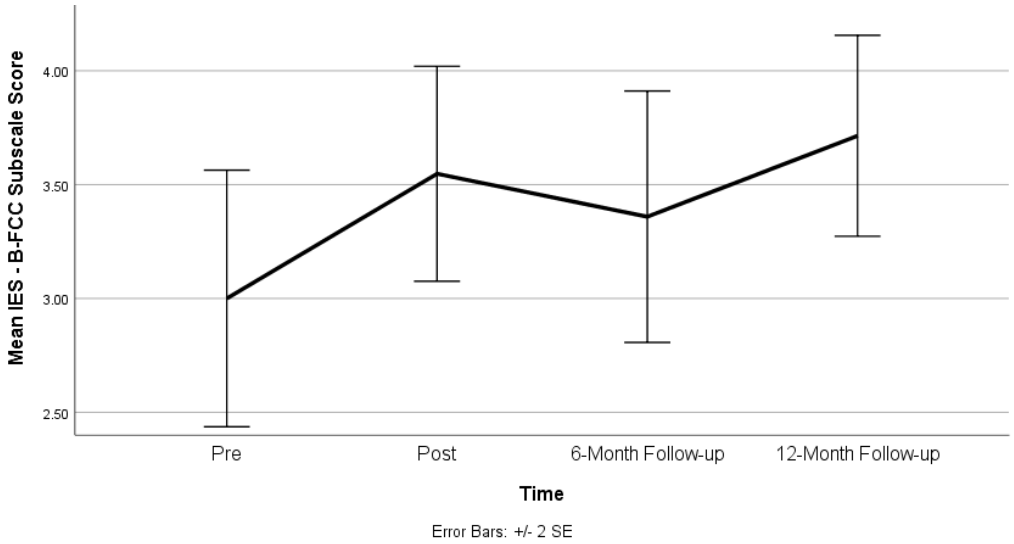

Figure 25. Mean Intuitive Eating Scale (IES) – Body-Food Choice Congruence (B-FCC) subscale score as a function of time.

In their PTIs, participants (n = 11) described a number of *changes made to their eating habits* as a result of their participation in the HLM-ABC program (Table 10). These changes corresponded with modifications in 1) *how they were eating* (i.e., eating more mindfully) (n = 10), 2) *what they were eating* (n = 4), and 3) *when they were eating* (n = 5). With respect to the first of these changes, some of the women described being more thoughtful about their reasons for eating (n = 6). One participant (P14) explained:

> …we had to rate the type of hunger we were having—is it bored hunger, is it biological hunger, is it emotional hunger? Like that kind of stuff. I found having to actually stop and keep track of that kind of thing really helped in terms of thinking about why I'm eating, what I'm eating, when I'm eating. And I find, even though I don't submit that to anybody anymore, I find it still comes to mind when I'm making choices about what I'm eating…

A number of women (n = 3) also spoke about how they developed greater consciousness of their internal bodily sensations around eating and relatedly, their unique eating preferences, which led to more intentional choices. One woman (P04) stated:

> …It was actually the first time, I mean it seems obvious that you shouldn't eat when you're not hungry…I heard that [laughing], but it didn't really ever actually sink in. And in this program, I started to realize I ate dinner because dinner was ready. Because

> everyone else was hungry. And that I don't overeat massively, but I eat more than I need to. And, you know, instead of feeling just full, sometimes I'm a little too full…I'm thinking about what I'm eating and how I feel [now]… I've never ever focused on how food made me feel. Seems so crazy.

Another participant (P07) described:

> I think, it made me more aware. It didn't necessarily change, like I don't eat breakfast, I haven't all my life…that habit has been built up and it didn't break me of it… But what it really broadened was, I'm more conscious like when I go out to a restaurant. I double think what I'm ordering.

Another woman stated:

> It's helped me be more mindful about what I do want to eat. So I actually, since the program, have become a plant-based eater. So that wasn't something that—you know, I didn't necessarily do for weight loss—it was more just like I needed to sit and figure out, what do I feel good about? So, for me, it was—I'd been toying with that idea for a long time. So it was more like, I think it's trusting your instincts, which of course we learned from the program (P11).

In terms of reported changes in *what they were eating*, participants described eating a better balance, or proportion, of 'healthy' foods to 'unhealthy' foods (n = 3). For example, one participant (P19) shared:

> I think that whole 80:20 [guideline presented in the program referring to a ratio of 'healthy' to 'unhealthy' foods], that was very good for me too because, again, I think I'm that all or nothing kind of thing. So the 80:20 rule … that whole going without feeling deprived.

Another participant (P06) explained:

> For a while I did think, okay I shouldn't ever go for Chinese food, it's so fattening and it's so saucy and this and that. But then I found a way to order certain dishes that may not be perfect, but you know, 80/20.

Another way that some of the women changed *what* they ate, was in terms of reducing the actual amount of food they ate (n = 4). One participant (P02) described:

> I think that I'm a little bit more conscious or mindful of just eating half of it if I'm full and then taking the other—which I normally would do anyway, but I don't know. I think it has made me a little bit more aware of when I'm satisfied versus full, and like, ugh, I can't eat anymore, and like that feeling.

The other way some of the participants described altering what they ate, was by overcoming temptations (*n* = 7). For example, one woman stated, “Potato chips, I have to admit, that was my down fall. I've been really good at choosing something else.” Another participant (P15) spoke about better managing temptations within the specific context of eating with others:

> I did like a lot of social eatings, and the program really helped me to realize that just because everybody else is having the chocolate cake, I don’t need the chocolate cake. Like it was just like a lot of my eating was just more mindless eating because everybody else was doing it.

One woman described how a particular skill learned in the intervention (increasing awareness of one’s “saboteurs,” or unhelpful self-talk) helped her to overcome temptation, stating, “…I find myself thinking about [the saboteurs] as I’m about to pass by a McDonalds or something. So, I’m using that information… and I’ve kept driving ever since” (P06).

The final major way the women spoke of having changed their eating habits was in terms of *when they ate* (*n* = 6). In particular, they described being more planful about their eating to reduce feelings of extreme hunger (*n* = 5). For example, one woman (P14) who often ate lunch and dinner out of the home because of her work schedule described:

> I'm thinking about doing a lot more meal prep so that I'm not just stopping in at McDonalds and picking something up on the way… it's become a lot more sustainable. I mean, I've thought about what I'm eating before but I'm doing it consistently or a lot more consistently and not just like, 'Oh I feel like crap because I've eaten out every day for the last 7 days, now I should change my eating,' but like kind of not getting to that point. Again, that kind of being proactive versus retroactive.

Another woman (P19) spoke of trying to modify her longstanding pattern of infrequent eating:

> I think I did realize that I probably actually wasn't eating like often enough or enough in general. I think I realized that I was waiting too long…I always actually did, since diagnosis, try to make really good choices and things like that and I think I was really hard on myself in terms of waiting too long in between meals because I would wait until I didn't want to stop and pick up—if I was out on the road—I didn't want to get anything

> that I knew wasn't good, so I think I made more of an effort to kind of plan. Like plan for those moments, take stuff with me… because what I would do is, instead of making a bad choice, I just would go without. So, I'm not the person that would stop and let's say go to a drive through. I wouldn't do that but then I would just go without. And then I realized that that's not good, and I think I also felt that I had to make it really complicated, but it was really simple just to know to always kind of have stuff with me.

Another way some of the participants modified *when* they eat was in terms of trying to eat during times when they actually feel hunger as opposed to when feeling emotional (n = 3). As one woman (P06) put it:

> If something happens that I'm feeling sad or frustrated about, then I want to go for one of the 20 percent ['fun'] foods, and I try not to do it at that time, because I'm trying to take control of that emotional eating. So, I realize right away that I'm feeling sad or frustrated with the situation and right away I think, okay I'm going to the kitchen, and I try to stop myself at that point and think, well that's not really the way to deal with your feelings right now. So, I like to have my 20 percent when I'm not feeling emotional [laughter]. Right, like on a Saturday night because I *chose* to have it on a Saturday night.

Moving habits. The average level of PA across the sample (as assessed using the GLTEQ) increased from 'moderately active' at pre-intervention (T0) (M = 21.57; SD =19.05; range = 0.00-74.00) to 'active' at post-intervention (T1) (M=33.36; SD = 18.26; range = 6.00-64.00). This was a medium effect. The level of PA remained essentially the same from pre-intervention to 6-months follow-up (T2) (M=21.38; SD = 10.98; range = 6.00-44.00), and increased from 'moderately active' at pre-intervention to 'active' at 12-months follow-up (T3) (M=25.92; SD = 17.10; range = 3.00-60.00). This was a small effect.

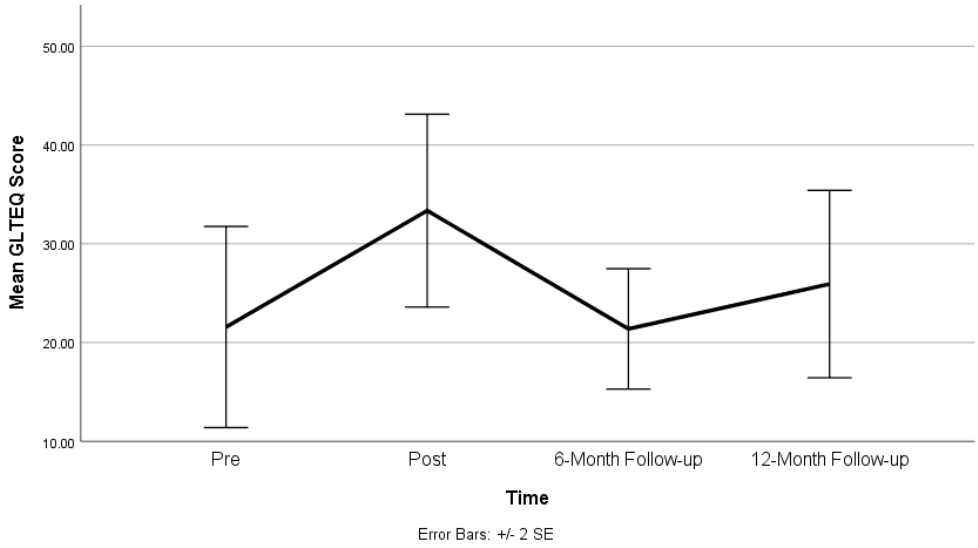

Figure 26. Mean Godin Leisure-Time Exercise Questionnaire (GLTEQ) score as a function of time.

Table 5

Pairwise Comparisons of Behavioural Outcome Scores at Baseline (T0) with Post-Treatment (T1), 6-Month Follow-up (T2), and 12-Month Follow- up (T3)

Variable	T0-T1 *d* [95% CI]	T0-T2 *d* [95% CI]	T0-T3 *d* [95% CI]
Total IES	-0.91+++ [-1.73, -0.097]	-0.81+++ [-1.65, 0.037]	-1.12+++ [-1.96, -0.29]
IES-UPE Subscale	0.53++ [-0.26, 1.32]	0.22+ [-0.59, 1.034]	0.72++ [-0.082, 1.52]
IES-EPR Subscale	-0.77 ++ [-1.58, 0.033]	-0.604++ [-1.43, 0.22]	-1.29+++ [-2.15, -0.44]
IES-RHSC Subscale	-0.77++ [-1.58, 0.033]	-0.83+++ [-1.67, 0.015]	-0.75++ [-1.55, 0.055]
IES-BFC Subscale	-0.63++ [-1.43, 0.16]	-0.44+ [-1.26, 0.38]	-0.76++ [-1.56, 0.046]
GLTEQ	-0.72++ [-1.52, 0.08]	-0.27+ [-1.046, 0.51]	-0.21+ [-1.02, 0.61]

Note: *d* = Cohen's d; CI = 95% confidence interval; + = small effect, ++ = medium effect; +++ = large effect; UPE = unconditional permission to eat; EPR = eating for physical rather than emotional reasons; RHSC = reliance on hunger and satiety cues; BFC = body-food congruence

During the PTIs, the participants (n = 8) described a number of *changes made to patterns of physical activity* after having participated in the HLM-ABC program (Table 10). Five

participants described *approaching movement more flexibly*, tailoring their expectations to be more realistic and thus more likely achieved. For instance, one woman (P02) explained:

> I think this is just a more realistic approach to like a life change—like a lifestyle change. But I think that, just thinking of it that way- that any kind of movement is valuable- that really helped me because I used to put a lot of pressure on myself that I wasn't going to the gym for an hour – if I wasn't doing this much cardio or that much strength training, then it really wasn't worth it. And so that's kind of shifted in me; I'm a little more laid back about what I do and how long, as long as I'm doing something.

Another participant shared:

> It was sort of sporadic with doing [activity] and I'm virtually, probably doing something every day. I put my Fitbit back on, so I think, I think what does that for me is just say, 'okay, you've done really well, just with general activities,' but, you know, which is fine, Because before it was, 'okay, you felt you had to exercise.' But the Fitbit will tell you just in general you're doing enough that day and then you can just sort of top it off if you're not. So that's what I've been doing, or, you know, sort of specifically saying, 'I'm probably not going back to the gym 'til the Fall, just because, you've got enough other things to do,' but, in the evenings I'll just go on my treadmill. I'll say, 'well I didn't do enough today, so at least this will finish it off for me.'

The other way participants (n = 3) seemed to change their way of thinking about PA was in terms of the *increased importance placed on movement and its inherent benefits*, as opposed to it being a means toward the end of weight loss:

> Okay, so in my mind before was that exercise isn't really going to take weight off, it's the eating. But now, they've changed it to *moving*, which I like way better than *exercise*. And so even though I still feel moving isn't going to take your weight off, moving is going to give you health (P06).

In the words of another participant (P15):

> I'm more active now. And I'm really looking at what I like and if I haven't done anything, like in terms of any activity, I can really feel it. So it's helped me start to be more active and I know I just need to sort of rev it up.

Several participants also described *increasing their overall amount of movement* (n = 6) and *engaging in more enjoyable and diverse forms of movement* (n = 5), such as the following woman (P04) who was inspired to try, and discovered that she enjoyed, activities outside of her

usual routine and comfort level:

> It made a big difference to me was the one about trying different exercises… I actually did try a lot of different things and I've stuck with doing a lot of variety in my exercise. And I think that was really great…I have been walking for the last year every day. And then I started lifting weights, and I was doing the same thing and I guess at the time that during that segment [in the program], I decided, okay I'll try riding a bike again. I hadn't ridden a bike in years. And I loved it. And then I met somebody while I was doing the Stairmaster at the gym. And she said 'you should try the classes.' So I started. It was really all in the same week I decided because it was part of the module. I decided, 'okay I'll go to a class,' 'cause they kind of made me uncomfortable, I didn't think I would be able to do them. And then, I just expanded. So, I'm doing lots of different classes. I'm doing Nordic walking, I'm going biking, I'm taking, you know, exercise, calming classes and it really came out of that, you know, 'try different things,' exercise.

A number of participants (n = 3) also described changing the way they move in terms of *increasing movement in little informal ways that add up* over time, such as "making a choice to park my car further away when I go into a store" (P14). Finally, three women described *creating greater accountability through structure*. One woman (P04) explained:

> For me to exercise, like for the walking, I did because my husband would ask me to walk every day, and would walk with me and it kept me walking because I would never do it on my own. And then, what I found when I did the exercise classes, I got to know the instructors. And then I feel like, I'm expected there. So, I need to be there because I've like, you know, I haven't actually committed, but I feel like I've committed. And, that they'll know if I'm not there. So it gets me there, you know, five or six times a week.

Another woman (P18) explained how her fellow HLM-ABC group members became a potential source of accountability once the program ended:

> That's what we're trying with our little after group. People starting saying on a Sunday, "you know, do you want to report in, and say what your week was like? Do you want to, you know, do you want a little feedback on it? Or, do you want to at least submit it?" So you feel like you're still accountable to somebody. So we're going to try that.

Psychosocial health. The HLM-ABC program's potential to improve participants' psychosocial functioning was determined by triangulating quantitative and qualitative measures of motivation and attitudes toward change, and psychological well-being. Motivation and attitudes toward change was assessed according to scores on the MCQ, N-SES, E-SES, as well as

qualitative feedback regarding this phenomenon that emerged from the PTIs. Emotional well-being was assessed according to a measure of QoL (FACT-B), emotional distress (HADS), body image distress (BIS), as well as relevant qualitative findings that emerged through the PTIs. Pairwise comparisons were performed for each of the repeated outcome measures at T0 to T1, T2, and T3 (see Figures 27-34), and effect sizes are presented in Table 9. Qualitative themes are summarized in Table 10 (Theme 2).

Motivation and attitudes toward change. Motivation for change, as measured using the MCQ, did not change from pre-intervention (T0) (*M* = 8.92; *SD* =0.52; range = 7.92-9.75) to post-intervention (T1) (*M*=9.21; *SD* = 1.44; range = 4.75-10.00). Motivational change increased from pre-intervention to 6-months follow-up (T2) (*M*=9.15; *SD* = 0.87; range = 7.42-10.00) and from pre-intervention to 12-months follow-up (T3) (*M*=9.40; *SD* = 0.83; range = 7.33-10.00). These effects were small.

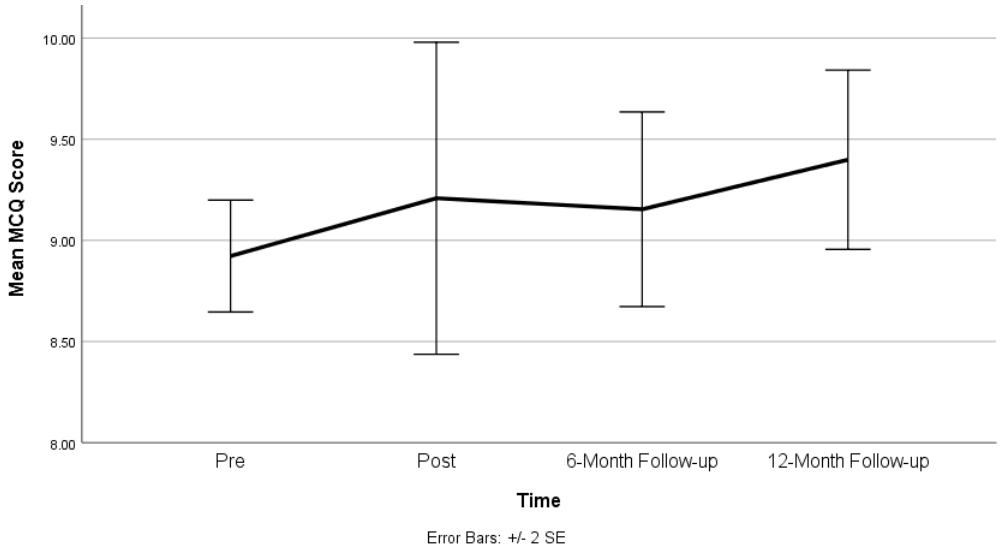

Figure 27. Mean Motivational Change Questionnaire (MCQ) score as a function of time.

Participants' self-efficacy regarding nutrition (N-SES) was also measured at baseline (T0), post-treatment (T1), 6-months follow-up (T2), and 12-months follow-up (T3), and pairwise comparisons were performed to compare baseline scores to scores at all other time points. Effect

sizes are reported in Table 8. N-SES essentially remained the same from pre-intervention (T0) (*M* = 14.14; *SD* =2.69; range = 10.00-20.00) to post-intervention (T1) (*M*=15.00; *SD* = 3.94; range = 7.00-20.00) and from pre-intervention to 6-months follow-up (T2) (*M*=14.23; *SD* = 3.61; range = 9.00-20.00). N-SES increased, however, from pre-intervention to 12-months follow-up (T3) (*M*=15.79; *SD* = 2.83; range = 10.00-20.00). This was a medium effect. These finding suggests that between the time prior to participating in the HLM-ABC and 12-months following completion of this program participants' perception of their own personal agency or control over their eating had increased.

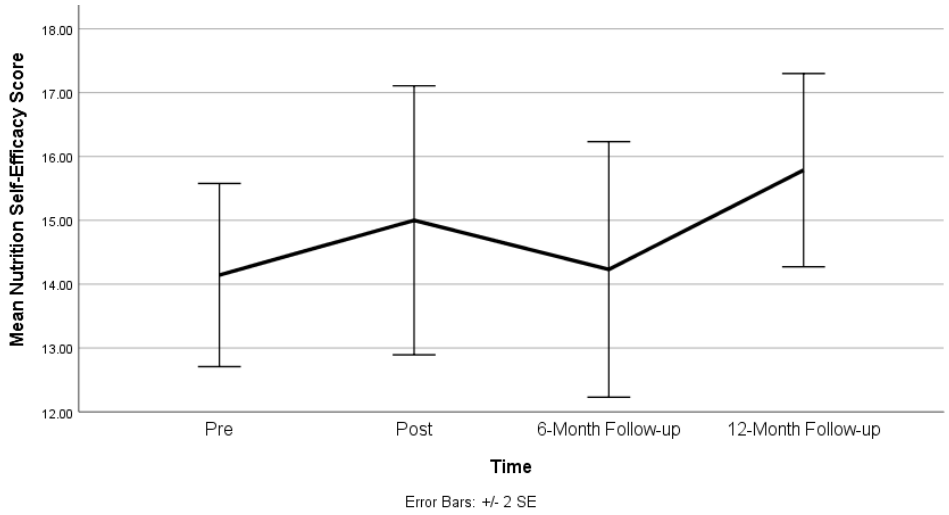

Figure 28. Mean Nutrition Self-Efficacy Scale (N-SES) score as a function of time.

Participants' self-efficacy regarding exercise (E-SES) was also measured at baseline (T0), post-treatment (T1), 6-months follow-up (T2), and 12-months follow-up (T3), and pairwise comparisons were performed to compare baseline scores to scores at all other time points (effect sizes are presented in Table 8). E-SES decreased from pre-intervention (T0) (*M* = 12.93; *SD* =3.27; range = 8.00-20.00) to post-intervention (T1) (*M*=12.21; *SD* = 4.92; range = 5.00-20.00). E-SES decreased from pre-intervention to 6-months follow-up (T2) (*M* =11.39; *SD* = 4.79; range = 5.00-20.00). E-SES decreased from pre-intervention to 12-months follow-up (T3) (*M*=11.79;

SD = 4.08; range = 6.00-20.00). These effects were small, medium, and small, respectively. These findings suggest that between the time prior to participating in the HLM-ABC program and 6- and 12-months following completion of the program, participants' perception of their own personal agency or control over their exercise habits decreased slightly.

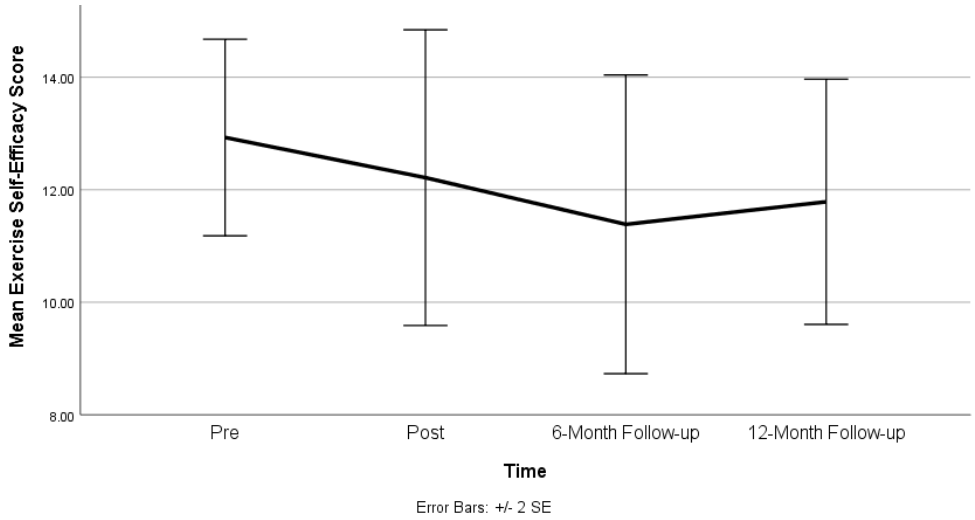

Figure 29. Mean Exercise Self-Efficacy Scale (E-SES) score as a function of time.

Participants described a number of specific *changes in their mentality or attitudes toward health behaviour change* during the PTIs (Table 10). The first of these changes was *adopting a more gradual and continuous approach to change* (as opposed to sudden) (*n* = 10), as illustrated by the following quote:

> I think [the most significant thing I learned from the program is] making different choices and that it doesn't all have to be done at once. Like you can make small changes, you know, that will eventually build up to larger changes. It doesn't have to be a cold turkey type of thing. Like I can't, you know, I don't have to cut out everything in order to be healthy… making small changes (P10).

Another participated (P18) explained:

> I wanted to lose some weight, and, get some exercise, get back on track. And you know…I thought it would come off faster. But that's okay too. That's okay. It's, you know, if I can do a few more pounds in the next ten weeks, if I just sort of look at it that way… I think we all said that in the first place though, you know, if you look over a year,

> if you can lose, you know seven or eight pounds in ten weeks and you stay with it, maybe you lose twenty over a year. And then in three years you would have lost sixty pounds.

Several (n = 9) participants spoke about how the program also helped them develop a *more flexible and self-compassionate* (as opposed to rigid, extreme and critical) attitude toward accomplishing and maintaining their health goals. The following quote exemplifies how one woman's increased self-compassion manifested in the form of non-judgmental permission to engage, or not engage, in certain behaviours according to her own personal experience and preferences. In the context of being interviewed about her least favourite topic ("anything to do with exercise") in the program, she responded:

> I… was like, okay I'll walk the dog. Did I do anything out of the ordinary? No, I didn't go to the gym. And I didn't have the desire to change that, you know what I mean? It made me aware of just how 'non-movement' I am right now, but I'm at a time right now that that's good enough for me. I'll deal with that later, type of thing (P07).

Another theme that emerged through the PTIs regarding motivation and attitude toward change was that of *feeling efficacious* (n = 11). This finding seemed to be related to participants' belief that their efforts to live healthier would be *sustainable over time* (n = 9). The following quote seems to illustrate how the above themes of increased self-awareness, flexibility, and self-compassion seemed to contribute to one woman's sense of confidence in her ability to persist with her health goals:

> I certainly do [feel I am living a healthier lifestyle after participating in the program]. I am eating a much healthier diet, I'm not as hard on myself when I indulge in something... Sometimes when I would do that previously, if I would indulge in something, I would just fall off the diet. Like your program was a much more gentler approach, where it's more forgiving, so it's easier to get back on track. And so yes, if I do fall off now, I do get back on track (P17).

Other accounts of feeling efficacious reflected a sub-theme of feeling *empowered through increased self-awareness* (n = 9). For example, one woman (P11) described discovering

about herself that she “tends to be a person who pushes myself probably a little too far” and how this pattern contributes to feelings and behaviours that are…

> …not necessarily always healthy. You know, and that's where identifying those voices in my head was really good for that because then I could go, “Oh okay, I get who this is talking to me right now.” So it's kind of more like that self-talk and those decisions and that emotional awareness… to have faced that point where I kind of felt pushed to that point where I was making a decision to quit, was kind of a turning point and that's where I was like—I made the decision to quit and then I faced it and went, “Wait a minute, no, that's not me, that's not truly who I am. That's just this voice.”

Another participant (P07) described how the program helped increase her awareness of her internal dialogue and how doing so positioned her to feel more confident in making healthier choices:

> I definitely do [feel that I am living a healthier lifestyle] … …it’s been the ‘coach’, that whole session [on self-talk]. And the ‘rebel’… stuck with me. I find, you know when I go out and it's like "oh, you know what, I deserve a treat," I kind of double think. I have had a couple, you know, a bad day where I did buy a bag of potato chips, but it was okay. “Now you've done it, you've got it over with. Let's move on, let's get back.” Whereas before, I'd be all, "You know, who cares? I'm going to be this way, and screw it anyway.” So yeah, it's helped…Now I feel like it is in my hands. I kind of feel more it is in my hands to deal with. Whereas before I would just not be happy and it got to the point where it was like "Okay, I'm just going to keep eating because I don't care. I just don't care because I don't know what the hell to do."… I feel good that it's in my hands, I know there is a solution, and I know, like I do feel I know what the block is.

The final way in which participants (n = 5) spoke of the program shifting their attitude toward health behaviour change was in the way it promoted *placing greater value and prioritization on self-care*. One woman (P11) spoke about how the program emphasized self-care not only in its teachings, but also experientially, and how with the support and engagement of the facilitator, she made a meaningful commitment to further invest in herself:

> I made a decision to take a leave of absence from work, which was really hard to do but I know that it was a huge act of self-love… It was kind of like, “wait a minute…even though I know what I enjoy doing, I'm not doing it because there's literally no time in the day when I can do it.” … I found the program beneficial… although the modification wasn't weight loss, there definitely was some modification… I think because it was structured and because there was some accountability—and it wasn't a threatening

> accountability piece—it was just that you understood that it was *self*-serving, it benefited *you*. So that was kind of a nice thing. I've been on other kind of programs in the past where the accountability piece was kind of like, 'oh I've got to hit this goal out of fear' kind of thing, where this was like, 'I've got to hit this goal because it's *my* goal. This is what I want to do. This is how I want to change.' So, it was kind of a bit more self-directed that way.

Another participant (P19) described how she gradually adopted a pattern of greater self-nurturance, and how this behaviour became inherently reinforcing:

> Especially the emotional part [of the program]… it got me really thinking about it every day and it became kind of like a practice… I started making it a priority and then eventually, instead of thinking about it at night before I went to bed, I started thinking about it when I woke up. So it was like, it started creeping its way up to the top of the list and I don't even know why I say "it" because it really means "me." Like it was actually me, as I was making myself a priority, which is what I learned… I would say that has been a big takeaway for me…I didn't realize how much I wasn't doing that. So even just doing the program was still doing something for myself, and I didn't realize what a lack there was in that department. So I started taking the program as, I just had to kind of think about it differently, that I was doing something for myself instead of taking it as like one more thing to do, you know? Like in the beginning, it kind of felt more like a chore… but then it started feeling like it was part of the self-care… The list with the self-care [activities], that was very good too. I actually took a screen shot of that and it's in my phone, and I always refer to it…I always refer to it and I make sure that I choose things from there, like daily. And for me, that was a big deal. That was almost like a really good distraction from a lot of stuff, like a healthy distraction you know?

Psychological well-being. QoL, as measured by the FACT-B, remained essentially the same from pre-intervention (T0) (M =104.99; SD =16.36; range = 77.00-128.00) to post-intervention (T1) (M =105.10; SD = 18.22; range = 64.00-131.00). QoL decreased from pre-intervention to 6-months follow-up (T2) (M =101.14; SD = 21.22; range = 63.00-139.00), and was essentially the same at pre-intervention as 12-months follow-up (T3) (M =105.88; SD = 21.71; range = 61.00-133.00). These results reveal that QoL remained generally unchanged, except for a temporary decrease 6-months after treatment, before returning to baseline level.

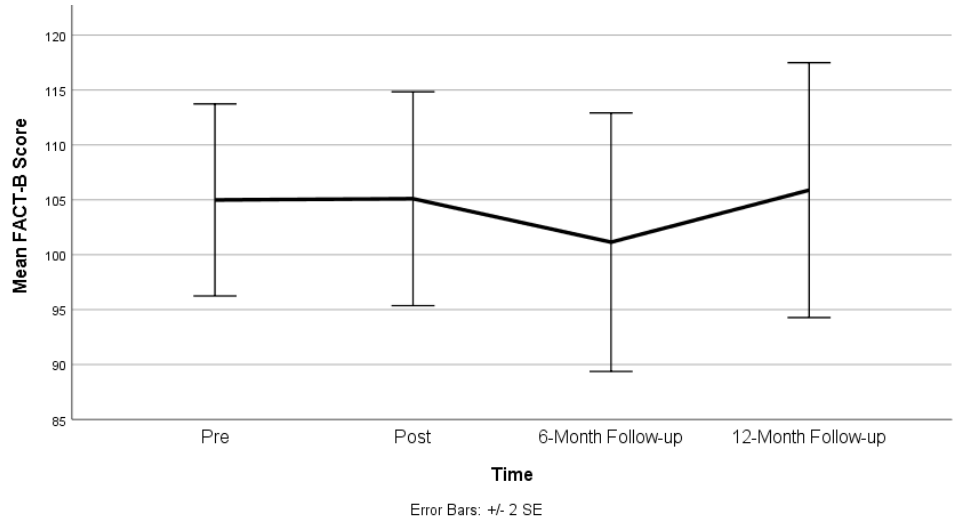

Figure 30. Mean Functional Assessment of Cancer Therapy – For Patients with Breast Cancer (FACT-B) score as a function of time.

Emotional distress (according to the total HADS score, out of a possible score of 21) increased from pre-intervention (T0) (*M* = 10.86; *SD* =4.99; range = 4.00-22.00) to post-intervention (T1) (*M*=12.43; *SD* = 7.87; range = 0.00-32.00) and from pre-intervention to 6-months follow-up (T2) (*M*=13.85; *SD* = 9.18; range = 2.00-31.00). These were small effects. There was essentially no change in emotional distress from pre-intervention to 12-months follow-up (T3) (*M*=10.29; *SD* = 6.32; range = 1.00-24.00). These results suggest that while emotional distress increased immediately and shortly after participation in the HLM-ABC program, by one-year follow-up, distress returned to baseline level.

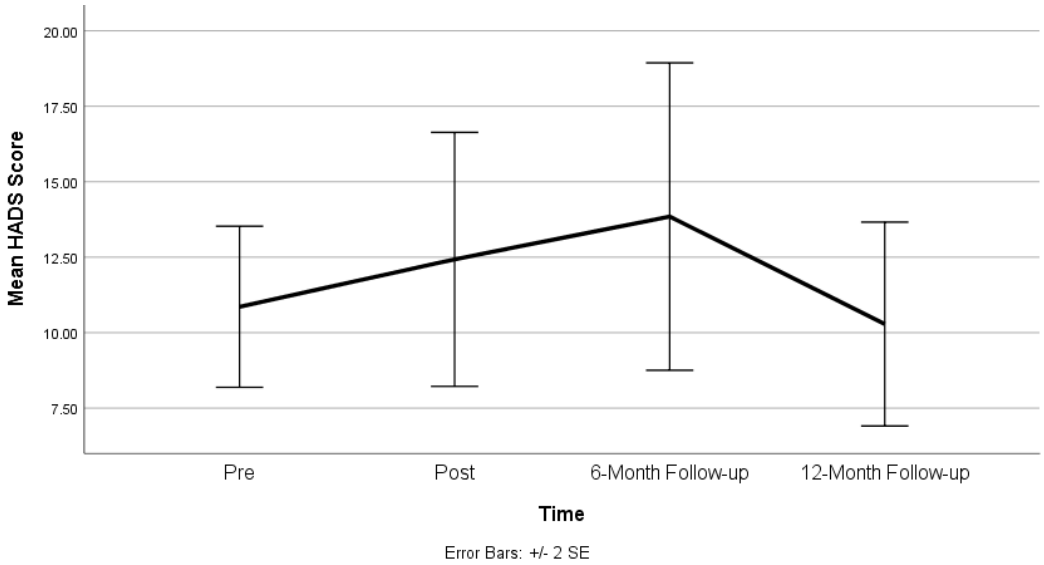

Figure 31. Mean Hospital Anxiety and Depression Scale (HADS) score as a function of time.

Analysis of the HADS anxiety subscale revealed that the sample's average symptoms of anxiety increased from pre-intervention (T0) (*M* = 5.93; *SD* =3.05; range = 2.00-11.00) to post-intervention (T1) (*M*=7.14; *SD* = 4.09; range = 0.00-16.00), and from pre-intervention to 6-months follow-up (T2) (*M* =7.69; *SD* = 4.68; range = 1.00-15.00). These were small effects. There was essentially no change in symptoms of anxiety from pre-intervention to 12-months follow-up (T3) (*M*=5.93; *SD* = 3.85; range = 0.00-11.00). These results suggest that anxiety increased immediately and shortly after participation in the HLM-ABC program, but by one-year follow-up, returned to baseline level.

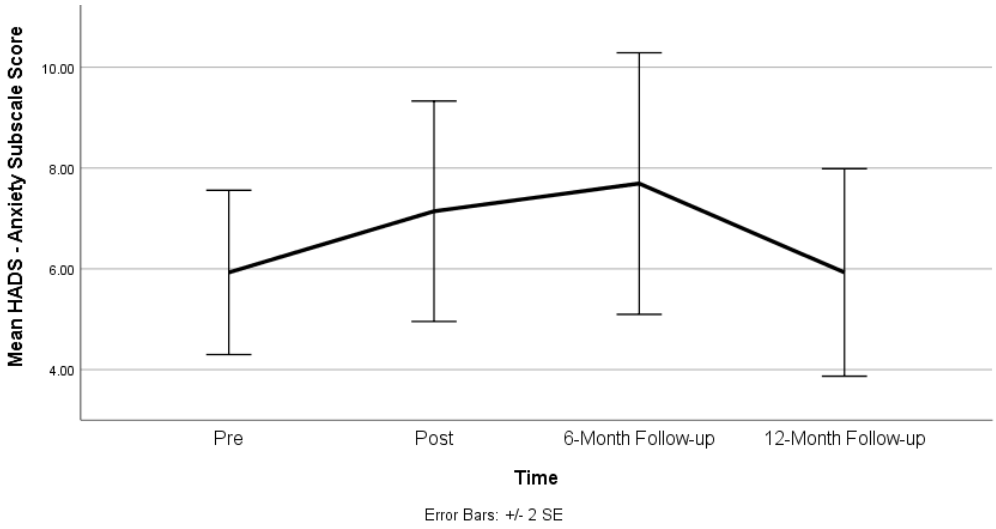

Figure 32. Mean Hospital Anxiety and Depression Scale (HADS) – anxiety subscale score as a function of time.

Analysis of the HADS depression subscale revealed that the sample's average symptoms of depression essentially did not change from pre-intervention (T0) (*M* = 4.93; *SD* =3.41; range = 0.00-11.00) to post-intervention (T1) (*M* =5.29; *SD* = 4.60; range = 0.00-16.00). Depressive symptoms increased from pre-intervention to 6-months follow-up (T2) (*M* =6.15; *SD* = 5.37; range = 1.00-18.00). There was essentially no change in symptoms of depression from pre-intervention to 12-months follow-up (T3) (*M* =4.36; *SD* = 3.34; range = 0.00-13.00). These findings indicate that there was a delayed, and temporary, increase in depressive symptoms at 6-months follow-up but that these symptoms ultimately returned to a baseline level.

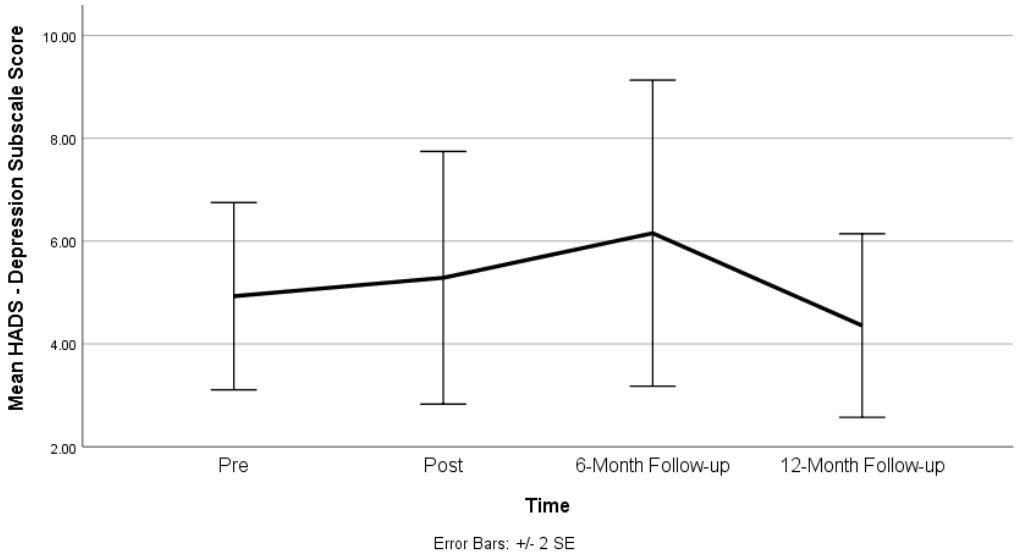

Figure 33. Mean Hospital Anxiety and Depression Scale (HADS) – depression subscale score as a function of time.

Body image distress was measured using the BIS, where a lower score is indicative of better body image (i.e., less distress). On average, body image distress decreased from pre-intervention (T0) (*M* = 14.48.99; *SD* =6.66; range = 2.00-25.00) to post-intervention (T1) (*M* =13.07; *SD* = 7.54; range = 3.00-26.00). This effect was small. Body image distress remained essentially the same from pre-intervention to 6-months follow-up (T2) (*M* =13.50; *SD* = 7.81; range = 1.00-26.00). Body image distress decreased from pre-intervention to 12-months follow-up (T3) (*M* =13.14; *SD* = 7.13; range = 3.00-26.00). Again, this effect was small. These results suggest that on average, women in this sample were slightly less distressed about their bodies immediately after participating in the HLM-ABC program, and still one year following their participation.

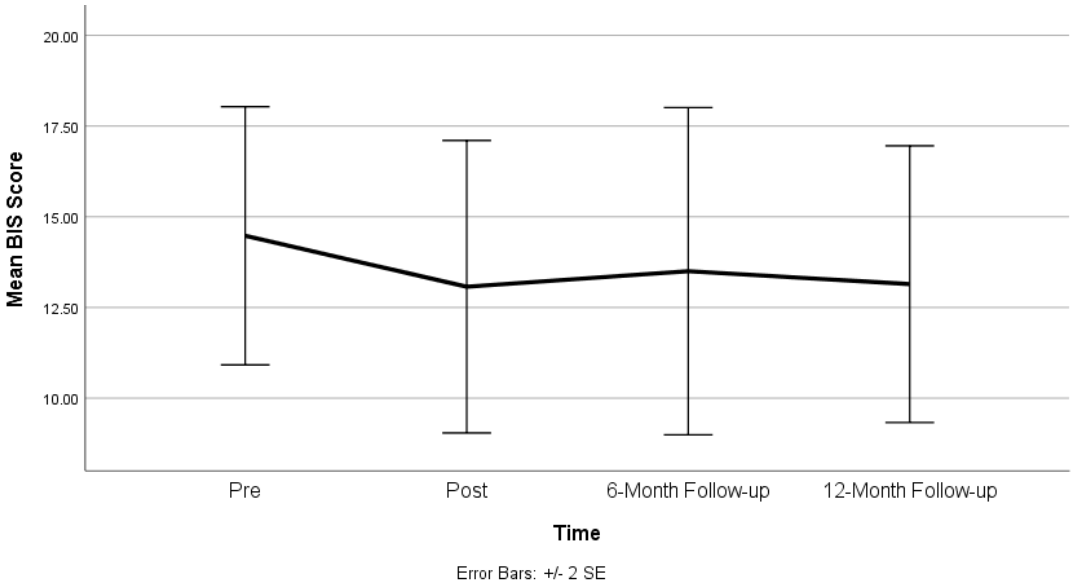

Figure 34. Mean Body Image Scale (BIS) score as a function of time.

Table 6

Pairwise Comparisons of Psychosocial Outcome Scores at Baseline (T0) with Post-Treatment (T1), 6-Month Follow-up (T2), and 12-Month Follow- up (T3)

Variable	T0-T1 *d* [95% CI]	T0-T2 *d* [95% CI]	T0-T3 *d* [95% CI]
MCQ (Motivation)	-0.18 [-0.96, 0.60]	-0.23+ [-1.04, 0.59]	-0.42+ [-1.21, 0.36]
N-SES	-0.18 [-0.96, 0.60]	0.072 [-0.74, 0.88]	-0.63++ [-1.43, 0.16]
E-SES	0.23+ [-0.55, 1.0050]	0.63++ [-0.21, 1.46]	0.38+ [-0.41, 1.16]
FACT-B	-0.01 [-0.79, 0.77]	0.36+ [-0.46, 1.17]	-0.06 [-0.83, 0.72]
HADS- Total distress	-0.30+ [-1.09, 0.48]	-0.45+ [-1.27, 0.37]	0.16 [-0.62, 0.94]
HADS- Anxiety	-0.50+ [-1.28, 0.29]	-0.50+ [-1.31, 0.33]	0.00 [-0.78, 0.78]
HADS- Depression	-0.11 [-0.88, 0.67]	-0.35+ [-1.16, 0.47]	0.20 [-0.58, 0.98]
Body Image Scale (BIS)	0.38+ [-0.40, 1.16]	0.11 [-0.74, 0.95]	0.36+ [-0.43, 1.14]

Note: *d* = Cohen's d; CI = 95% confidence interval; + = small effect; ++ = medium effect; MCQ = Motivational Change Questionnaire; N-SES = Nutritional Self-Efficacy; E-SES = Exercise Self-Efficacy; FACT-B = Functional Assessment of Cancer Therapy – for Patients with Breast Cancer; HADS = Hospital Anxiety and Depression Scale; BIS = Body Image Scale.

Six of the participants spoke about their relationship with their body during the PTIS, which revealed two broad themes regarding self-concept (summarized in Table 10): *some degree of change* (n = 5), *and unchanged* (n = 1). Only one of the participants (P02) described an unchanged, entirely negative experience of her body:

> I kind of found that I wasn't too open to [discussing body image]. I kind of was, I don't know, I think I have a bit of a barrier… I mean it's been a while since I've gone through reconstruction and I'm just not happy with, you know the way that I look and I don't know if that's ever going to change. So, it's just a topic that makes me feel really angry and kind of bitter… So that's a big part of my frustration, you know? Like I shouldn't be 159 pounds.

The other five women described at least some element of their self-concept as having shifted, or being in the process of shifting, following their participation in the HLM-ABC program. Two women described feeling better about their bodies in direct relation to perceiving that they had achieved some tangible physical change (i.e., weight loss, desired change in body shape, size, and/or strength). For example:

> Let's just say I feel better in terms of feeling stronger. I feel like I have more energy, I feel like my mobility is better, I just feel a bit more normal in terms of that aspect instead of before, which was really bad. But because of that, I would say I feel leaner. I don't actually know if I've lost weight… I think may have lost inches maybe but I feel better than when I started. (P19)

The other three women appeared to have 'reframed' their experience of their body, regardless of having achieved a desirable amount of weight or feeling as though they directly improved their body image. For instance, one woman (P07) described that while she still felt "not good about [her body]," she also felt more "empowered" in terms of recognizing her barriers to weight loss (e.g., medications, unhelpful extreme thinking) and that "finally after all these years, it's in perspective. It's not going to be a quick hit."

One woman explained how the program highlighted a long-standing pattern of self-criticism that she had been previously aware of and tried to change, and that her experience in

the HLM-ABC program inspired her to continue working at:

> When I was very young, around 13, I was very shy. And people would give me compliments and what I would say is "no". And remember, “no, no, no” echoing in my head…I taught myself to not to say “no” and just to say “thank you.” And, I basically cut out all of that negative internal conversation and went from being shy to being quite outgoing. And I realized that I have been, you know, not tremendously negative [in terms of that] internal conversation, but some negative internal conversation. And I guess that module helped me to think about that and to think about stopping it (P04).

Table 7

Qualitative Themes and Sub-Themes Regarding Preliminary Effectiveness Outcomes

Category	*n*	*%*
Theme 1: Behavioural Health Changes		
1.1 Eating habits	11	79
How they were eating (i.e., mindfully)	10	71
What they were eating	4	29
When they were eating	6	43
More planful	5	36
Eating when hungry (as opposed to emotional)	3	21
1.2 Moving habits	8	57
Increasing overall amount of movement	6	43
Engaging in more enjoyable and diverse forms of movement	5	36
Approaching movement more flexibly	5	36
Increased importance placed on movement and its inherent benefits	3	21
Increasing movement in little informal ways that add up	3	21
Creating greater accountability through structure	3	21
Theme 2: Psychosocial Changes		
2.1 Mentality/attitudes toward health behaviour change		
Adopting a more gradual and continuous approach to change	10	71
Feeling efficacious	11	79
Efforts sustainable over time	9	64

Empowered through increased self-awareness	9	64
More flexible and self-compassionate	9	64
Greater value and prioritization of self-care and nurturance	5	36
2.2 Self-concept		
Some degree of change	5	36
Unchanged	1	7

Note: *n* refers to the number of participants who endorsed each category. % refer to the percentage of participants from the overall sample who endorsed each category.

Summary of Key Findings

With respect to feasibility of implementation, the results of this study indicate that the HLM-ABC program yielded a recruitment rate of 31%, a 12-month follow-up retention rate of 93%, a homework completion rate of 91%, and discussion board engagement of 14 discussion board posts per participant over the 10-week duration of the program. The findings also reveal that participants evaluated the program as being largely acceptable, with some aspects of the intervention having been deemed more integral or satisfactory (i.e., theoretical orientation of the program, educational videos [especially those from Weeks 2, 3, 4, and 5], professional facilitation, and homework) than other aspects (i.e., online learning platform, and limited capacity for personalized and/or visual interaction). Finally, with respect to preliminary impact, participants in the HLM-ABC program evidenced trends in achievement and maintenance of healthier lifestyle habits up to one year following completion, based on a number of physical (i.e., modest but sustained weight loss, downward trend in BMI), behavioural (i.e., higher levels of PA and intuitive/mindful eating), and psychosocial (i.e., slight yet sustained improvements in motivation, self-efficacy regarding eating habits, and body image) outcomes.

CHAPTER V: Discussion

The purpose of this study was to develop and evaluate an online lifestyle intervention for overweight breast cancer survivors. The feasibility of implementation, acceptability, and limited-effectiveness of the HLM-ABC program were evaluated using a single-arm, mixed-method triangulation design. Given the small sample size, exploratory nature of the research questions, and anticipated common and unique ways the program may have impacted women and the various aspects of their health (i.e., physical, behavioural, psychosocial), both qualitative and quantitative measures were employed. As such, participants' subjective experiences and opinions were triangulated with their relatively more objective data, with a goal of cross-validating findings and developing a comprehensive understanding of not only *whether,* but *how,* this novel intervention is feasible, acceptable, and impactful for overweight women who have a history of BC and are seeking to live a healthier lifestyle during the survivorship period.

Feasibility of Implementation

The HLM-ABC intervention was determined to be feasibly implemented, as demonstrated in part by satisfactory rates of recruitment (31.48%) and retention at 12-months post-treatment (82.35%). Based on the 2010 CONSORT guidelines, an acceptable rate of attrition has been proposed to be 20% attrition at ≤ 6-months post-baseline, and less than 30% attrition at greater than 6-months post-baseline (Eldridge et al., 2016; Goode, Lawler, Brakenridge, Reeves, & Eakin, 2015). A systemic review of 27 non-face-to-face (i.e., online, telephone, and print material) lifestyle interventions for cancer survivors (Goode et al., 2015), found that the majority of these similar kinds of interventions (22 of 27) had retention rates of at least 80% at ≤ 6-months post-baseline and at least 70% retention at greater than 6-months post-baseline, while three studies reported more than 20% attrition at ≤ 6-months post-baseline and one study

reported more than 30% attrition at greater than 6-months post-baseline. Of the 10 studies that reported retention rates at 12-months follow-up, rates ranged from 4-45% with an average retention rate of 18%.

These results indicate that compared with other distance-based (i.e., non-face-to-face) lifestyle interventions for cancer survivors, the HLM-ABC program demonstrates an acceptable rate of attrition and can therefore be successfully implemented to completion with satisfactory commitment from participants. Program expectancy was also assessed to determine the extent to which participants believed the HLM-ABC program would yield desired outcomes, or in other words, presented a feasible means of developing healthier lifestyle habits. The average rating on the PEQ revealed that prior to commencing the intervention, participants held high hopes about its potential and, on average, believed that they would experience a 67% improvement in their physical and mental health as a result.

Rates of homework completion and DB posting were also examined to assess whether or not participants could be reasonably engaged in this novel, online group intervention. As demonstrated by a high rate (91%) of homework completion, it is feasible to implement homework as part of the HLM-ABC program and for participants to adhere to this expectation. The DB activity data indicates that participants across both cohorts posted an average of 14 times over the course of the 10-week program. When the data was inspected for each separate cohort, it was found that the average number of weekly posts more than doubled (increased from 5.4 to 14.0) between the first cohort (n = 5) and the second cohort (n = 9). The findings suggest that the DB engagement increased by increasing the size of the group and integrating formative feedback from group members in the first cohort (i.e., to consistently post a reply by the end of day to all unanswered DB messages that go unanswered by group participants themselves, and

inclusion of a mid-intervention phone call with each group member).

The GCQ provided a one-time (post-treatment) quantitative measure of the extent to which it was feasible to establish a satisfactory group alliance, or climate, in the context of this novel online, psychoeducational group. Table 11 displays the GCQ subscale scores alongside the same scores from the original normative sample of 12 outpatient psychotherapy groups (MacKenzie, 1983) and from 23 sessions of an open-ended cancer support group ranging from two to five group members per session (Daroff, 1996) for comparison.

Finally, the finding that all 14 (100%) participants who completed the 10-week HLM-ABC program also completed their follow-up measures 12-months later provides an additional, albeit indirect, measure of engagement in the program.

Altogether, the data reveal that the participants in the present study achieved relatively high levels of engagement, despite interacting remotely and without any in-person contact and, as mentioned above, some participants finding discussion board communication impersonal. The HLM-ABC group members were less avoidant (i.e., reluctant to take responsibility for change) than those in the normative psychiatric sample, likely because they self-selected to participate in a health-promoting program that explicitly aimed to increase motivation and self-accountability. In addition, the present sample's degree of distress was presumably lower than would be expected of a group of individuals receiving treatment for psychiatric and personality disorders.

The HLM-ABC sample scored higher on the avoidant subscale than did the comparison mixed cancer support group, meaning the HLM-ABC participants were more reluctant to take responsibility for change. One plausible explanation for this finding is that participants' scores were higher because the nature of the HLM-ABC intervention (i.e., change-oriented, independently and remotely accessed, and intentionally autonomy-promoting) demanded a

greater degree of self-accountability than would be expected in a support-oriented, in-person group. In other words, the HLM-ABC participants may have demonstrated greater hesitance to take accountability commensurate to the relatively greater demand for accountability.

The present group was characterized by a slightly higher level of conflict than Daroff's (1996) peer support group (a type of group aimed at increasing connection and support and minimizing expression of personal opinion or advice); but a lower level of conflict than MacKenzie's sample. This is not surprising given that MacKenzie's group was therapeutic (as opposed to psychoeducational or supportive) and likely involved a greater degree of intentional challenging. These findings indicate that despite there being less back-and-forth interaction between group members' DB comments, it is nonetheless feasible to foster a level of group cohesion in the HLM-ABC program that is reasonable in light of other comparison samples.

Table 8

Group Climate Questionnaire (GQS) Subscale Score Means and Standard Deviations (N = 14)

GQS Subscale	HLM-ABC online group	Normative psychiatric outpatient sample (MacKenzie, 1983)	Mixed-Cancer Support Group (Daroff, 1996)
	M (SD)	*M (SD)*	*M (SD)*
Engaged	18.36 (4.05)	14.61 (3.39)	14.3 (2.57)
Avoiding	8.29 (4.39)	10.33 (3.05)	5.70 (3.04)
Conflict	1.43 (1.55)	3.85 (2.25)	1.26 (2.09)

Feasibility of implementation was also assessed based on a single-item rating of program convenience along with qualitative feedback regarding convenience and challenges to engagement. The results indicate that in general, the program was rated to be convenient (by 71% of the sample), especially given its online nature. Notwithstanding, the participants described a number of circumstantial, personal, and technological challenges to participation

(Table 5). The most common of these challenges included: time of year; difficulty examining difficult emotions evoked by session content and related homework exercises; limited proficiency using computer technology; poor time management; and an online interface (Moodle@York) that was perceived not to be user-friendly or as portable as desired.

These results are consistent with findings cited elsewhere regarding barriers to women with BC during and after adjuvant treatment participating in PA (Browall, Mijwel, Rundqvist, & Wengström, 2018) (i.e., time limitations, competing family and work commitments). Interestingly, this study found that lack of access to a vehicle, active treatment and related physical side effects, and lack of/competing information or guidelines regarding PA were also barriers for this population. These findings lend support for implementing PA and/or lifestyle interventions (1) online (thereby minimizing the time commitment involved and the need for a vehicle) (2) during the after-treatment phase (so as to reduce physical/health barriers), (3) during a time of year when there are fewer competing commitments or travel, and (4) with the guidance or facilitation of supportive, competent healthcare professionals (to mitigate potential distress and provide reliable, valid knowledge and direction). It also seems to be important that individuals who are eligible to participate in such computer-mediated programs have sufficient familiarity and comfort with the technology and/or that such a program be offered via a more user-friendly, intuitive web platform than that employed in the current study.

Acceptability

Overall program satisfaction. The HLM-ABC program was deemed acceptable to participants, as per quantitative ratings and qualitative feedback regarding satisfaction with various aspects of the program and overall experience of participation. The majority (71%) described being satisfied with the program and that they would recommend it to others in their

position. A subset of participants (29%) indicated that they would recommend the program to others, but with the condition of setting clearer expectations regarding realistic outcomes. The major qualitative themes that emerged suggest that many of the women considered the HLM-ABC program to offer a new, more balanced approach to lifestyle change than they had previously encountered through previous diet and/or exercise weight loss approaches and that they liked the internal (versus external) focus. They also seemed to appreciate the program as an opportunity to discuss survivorship issues that they would not have otherwise. Interestingly, it seems that some women felt that the emphasis on a gradual, sustainable approach to healthy living was a pleasant, unexpected surprise, while other women expressed disappointment about such, as they hoped to lose more weight immediately.

Acceptability of program content. The findings reveal that most participants felt the videos and homework were important to their progress throughout the HLM-ABC program (86% and 79%, respectively). The most highly endorsed modules were those pertaining to developing awareness of unhelpful self-talk ("the saboteurs"), cognitive restructuring (developing an "inner coach"), and intuitive eating. Although the homework was described as effortful, it was deemed to be a valuable means of instilling accountability and fostering awareness of one's patterns.

Acceptability of online platform. The results were mixed regarding acceptability of the 'Moodle@York' platform. A minority of the study sample (36%) indicated that perceived the website to be easy to use, while most (64%) indicated that they "neither agreed nor disagreed" or "disagreed". More than half of participants (57%) "strongly agreed" or "agreed" that they felt confident using the website, while six participants "disagreed" and thus did not feel confident interacting with the Moodle@York site. The qualitative themes also revealed mixed perceptions of the online platform, with nearly equal number of accounts describing the website as being

accessible and inaccessible. These findings likely reflect the limitations of using an open-source, no-cost platform like Moodle; particularly, that such websites are typically less user-friendly, less personalized to the particular needs of participants, and less visually appealing than would be a custom-designed, yet expensive, website. It would be interesting to ascertain whether the overall acceptability of the HLM-ABC intervention would have been even greater if it were to be implemented in the future on a larger scale, with funds to allocate to website development.

Acceptability of group element. Satisfaction ratings regarding the group element were mixed, with 36% of the women having indicated that they "strongly agreed" or "agreed" that the DB was important to their progress in the program, 43% "neither agreed nor disagreed" and 21% "disagreed" or "strongly disagreed." The qualitative findings reveal that participants felt the DB reduced feelings of isolation, exposed them to alternate perspectives, helped them process their own learning, and was an opportunity to exchange resources. At the same time, the amount of interaction was perceived by some to have been unsatisfactory and the quality of connection impersonal and restrictive. Overall, the results suggest that participants have a preference for the program to be delivered in a group (versus individual) format but that they desired more interaction and greater opportunity for personal familiarization with one another, even if this were to have been at the expense of anonymity and privacy.

Despite some of the participants in the present study expressing dissatisfaction with the degree to which they felt connected to their fellow group members, the majority of feedback suggests that participants were satisfied with the program and their learning. This is consistent with research that has found that students do not necessarily consider social interaction as important or contributing to their learning in online courses compared to in-person courses (Beyth-Marom, Saporta, & Caspi, 2005). It has been hypothesized that learning may be more "a

process of interaction between learning and information or learning and instructor, rather than between learners" (Savvidou, 2013, p. 196).

Acceptability of facilitators/facilitation. Triangulation of the TSQ ratings with the PTI qualitative feedback reveals that the facilitators were seen as a trustworthy expert presence within the online program, their degree of involvement was acceptable and especially conducive to developing personal agency, and their interactive feedback was highly valued and engaging. All participants (100%) "agreed" or "strongly agreed" that the facilitator role is a necessary component of the HLM-ABC program, particularly for providing direction, information, and encouragement. These findings are consistent with other research documenting the critical function of professional facilitation in maximization of the utility and benefits of online groups (Gits, Ritter, Plant, & Lorig, 2013; Kissane et al., 2003; Male, Fergus, & Stephen, 2017).

The participants described being satisfied with the quality and amount of facilitation, with select participants having indicated that they would have benefited from additional support, especially surrounding emotional topics (e.g., body image). This feedback lends support for a step-care model of facilitation whereby all participants receive a minimum amount of contact from facilitators with the option for additional phone check-ins as warranted or requested.

Preliminary Effectiveness

The intervention demonstrated preliminary effectiveness according to objective and subjective indicators of improved physical, behavioural, and psychosocial health suggestive of living a healthier lifestyle, which were generally sustained up to one year after completing the program.

Physical health. On average, participants in the current sample lost 2.15 pounds between pre-treatment and the time that they completed the HLM-ABC program (approximately 10

weeks later). At one-year follow-up, the sample weighed an average of 5.36 pounds less than at pre-treatment, meaning that, on average, participants maintained a 2.73% reduction in baseline weight up to 12 months after completing the program.

A minimum of five percent reduction in body weight has been associated with significant health benefits and has therefore been identified as the cut-off for clinically meaningful weight loss (Borek et al., 2018; Rock et al., 2012; Swift et al., 2016). According to this guideline, five participants (36%) in the current sample maintained a clinically significant amount of weight loss at 12-months follow-up, with one participant having maintained a 40-pound (13.42%) weight reduction one year after completing the program. At 12-months follow-up, seven (50%) participants' weight had not changed significantly (less than 5% reduction) and two (14%) had gained a clinically significant amount weight. In comparison, Christian, Tsai, and Bessesen's (2010) found in their review of 'low intensity' lifestyle modification interventions that at 12-months follow-up, 29% of participants maintained a weight loss of 5% or greater, 27% lost less than 5% weight, and 43.6% lost no weight or gained weight. A large meta-analysis of 24 randomized controlled trials (N = 6,042) of group-based diet and/or exercise interventions for overweight/obese men and women reported an average reduction of 7.58 pounds at 12 months follow-up, varying from 0- 21.16 pounds. Percent reduction in baseline weight could be calculated for 23 of the studies, which revealed an average of 4.83% weight loss. Only 14 of these interventions yielded a minimum of 5% weight loss.

Goode and colleagues (2015) conducted a systematic review of 27 exercise, diet, and/or weight management interventions for cancer survivors that were delivered via non-face-to-face methods (telephone, short-message service, print, and/or Internet). These researchers found that of those interventions that measured weight loss from pre- to post-treatment, effect sizes varied

between 0.09 – 0.75, representing a 1.3-10.6% reduction in baseline weight. In comparison, the current study yielded results similar to or within this range, with effect sizes of 0.30 and 0.37 at post-treatment and 12-months follow-up, and 1.09% and 2.73% reduction in weight at post-treatment and 12-months follow-up.

Weight loss maintenance is very difficult to achieve, with an estimated 10-20% of formerly obese individuals being able to maintain significant weight loss long-term, and rapid weight gain being common (Tylka et al., 2014; Uhley & Jen, 2007). Researchers who have investigated the rapid-cycling of weight loss and regain (often referred to as 'yo-yoing') have found that such weight cycling is associated with insulin resistance (Lu, Buison, Uhley, & Jen, 1995), which may explain why some individuals experience great difficulty losing weight despite making changes in eating and activity that would otherwise be expected to generate weight loss. The study of weight-cycling in rats has found that such a pattern is associated with increased levels of 5-hydroxymethyl-2'-deoxyuridine, which is a marker of oxidized DNA damage and a risk factor of breast cancer (Djuric et al., 1996; Uhley & Jen, 2007). Thus, a history of repeated weight loss-gain cycling may place some women at increased risk of developing breast cancer (Uhley & Jen, 2007). Anecdotally, several of the women in the current sample described a longstanding history of repeated weight loss attempts via a number of various programs; further exploration of this theory may be warranted.

Behavioural health. Eating habits, specifically the degree to which participants were eating intuitively, improved from pre- to post-intervention (d=0.91) and this large effect was maintained at 12-months follow-up (d=1.12). This outcome provides a good indication of treatment fidelity, given that the concept of intuitive (or mindful) eating formed part of the theoretical basis of the intervention and thus participants were expected to have internalized this concept. These results

can be interpreted in comparison to other non-face-to-face lifestyle interventions for cancer survivors (Goode et al., 2015), which found that most (n = 9) of these sorts of interventions had a small effect on diet at post-treatment (d=0.2-0.49), while four had a large effect ($d \geq 0.8$), another four had a negligible effect, and two studies had a moderate effect (d=0.5–0.79).

The HLM-ABC program demonstrated a medium effect (d=0.72) on movement, with the sample increasing from an average level of 'moderately active' at pre-treatment to a level of 'active' at post-treatment. This effect, albeit small (d=0.21), was maintained at 12-months follow-up. This finding can be interpreted against the results of another study that investigated the effects of cancer-specific PA print materials and step pedometers on activity levels in BCSs (Vallance, Courneya, Plotnikoff, Yasui, & Mackey, 2007). This study found that from pre- to post-intervention, those participants who received the print material increased their PA by 30 minutes per week (d=0.25); those who were assigned to receive pedometers increased their activity levels by 89 minutes per week (d=0.38), and those who received both interventions increased their PA by 87 minutes per week (d=0.38). This study did not collect follow-up data.

Short, James, Stacy and Plotnikoff (2013) identify the lack of follow-up outcomes in this area as a shortcoming of this research but that when activity levels are measured via self-report (as opposed to more objective measures or pedometers), the effect sizes tend to be small. The Goode et al. (2015) meta-analysis of non-face-to-face lifestyle interventions for BCSs further concluded that when it comes to longer-term maintenance of PA and diet outcomes, effects are small (d<0.49) or not reported at all. Therefore, it is a strength of the current study to have collected this follow-up data, and to have yielded a large sustained effect on eating habits; the small sustained effect on PA is consistent with other non-face-to-face lifestyle interventions for this population to.

Psychosocial health. The results regarding preliminary effectiveness of the HLM-ABC program on psychosocial outcomes generally depict a positive impact on participants' attitudes toward change and self-concept, with some variable findings regarding exercise-specific self-efficacy and psychological well-being.

Attitudes toward change. Participants' level of motivation for change increased from pre-intervention to 6-months and 12-months follow-up. According to categorical analysis, the extent to which a person's motivation changed from pre-intervention to 12-months follow-up also appeared to be associated with how much their weight changed during this time; those women whose motivation decreased during this time were more likely to have also gained weight, those who did not experience a change in motivation were also more likely to have not experienced a significant change in weight (<5% reduction in baseline weight), and those women whose motivation increased were more likely to have lost weight of a significant (>5% reduction in baseline weight) or insignificant (<5% reduction in baseline weight) amount.

The qualitative findings also converge to depict a positive change in motivation and general attitudes toward change (Table 10, 2.1). In particular, participants described adopting an approach to change that is more gradual and continuous, and being more committed to prioritizing self-care (which encompasses taking greater care of one's body through healthy eating and moving).

Self-efficacy, a concept related to motivation, was also investigated to assess the extent to which participants felt confident in their abilities to carry out their intended exercise and nutrition goals. With respect to nutrition self-efficacy (N-SES), there was no change between pre-treatment and post-treatment or 6-months follow-up; however, there was an increase between pre-treatment and 12-months follow-up, with a medium effect. This increase in N-SES is

consistent with the finding that participants' self-reported eating habits changed in a positive direction, as captured through higher scores of intuitive eating (IES) and qualitative themes regarding changes in *how*, *what*, and *when* they were eating (Table 10, 1.1).

Contrary to expectations, exercise self-efficacy scores (E-SES) decreased between baseline and all subsequent time points. This quantitative result suggests that participants' confidence in their ability to be in control of their exercise habits decreased slightly, which deviates from the qualitative themes regarding *feeling efficacious* (Table 10, 2.1). Furthermore, a decrease in exercise self-efficacy seems to contradict the finding that self-reported levels of exercise (as measured by the GLTEQ) increased, on average. It is possible that self-efficacy may not have mediated or been directly related to actual levels of activity, which is a finding that has been reported by other studies of remotely-delivered PA interventions for BCSs (Forbes, Blanchard, Mummery, & Courneya, 2017; Rabin, Pinto, & Frierson, 2006; Vallance et al., 2007; Valle, Tate, Mayer, Allicock, & Cai, 2015).

This curious finding may also be explained through further inspection of the language used by this E-SES measure. The questionnaire asks respondents how certain they are that they can overcome barriers with respect to their "exercise" intentions, whereas the HLM-ABC program made a deliberate distinction between the concept of "exercise" (which conveys a formal, structured activity) and "movement" (a more informal part of daily living that can be accomplished flexibly and practically). Although the term "exercise" is commonly used in the literature and therefore informed the selection of this measurement tool in the present study, it is possible that the E-SES did not accurately assess the construct of movement that was targeted in the HLM-ABC program.

Another possible explanation for this unexpected decrease in E-SES is that the HLM-ABC

program was developed and implemented in close collaboration with two dieticians. Participants were provided basic information and guidelines regarding healthy eating (e.g., "the plate method" for selecting portions, instructions for noticing hunger and satiety cues, emotional eating and alternative coping strategies) and were given individualized feedback on their eating diaries from one of the dieticians. However, the program did not include a similar degree of integration of PA guidelines or collaboration with an exercise or rehabilitation specialist. For example, movement was targeted and informed primarily by research and principles of behavioural activation rather than evidence-based exercise guidelines or practices. Therefore, as a result of the program's relative emphasis on eating and dietetic influence, the women in the HLM-ABC program may have felt more confident in their abilities to persist in their eating goals than in their movement goals, which might explain the observed discrepancy between changes in nutrition versus exercise self-efficacy.

Psychological well-being. According to the average scores on the FACT-B**,** the current sample's QoL did not change from pre-treatment to post-treatment, but decreased slightly between pre-treatment and 6-months follow-up, with a small effect. By 12-months follow-up, QoL had returned to a baseline level. A minimum change of 6 points on the FACT-B total score has been identified as clinically meaningful (Eton et al., 2004), and therefore, this temporary reduction (of 3.85 points) at 6-months is not likely to have been significant.

A similar temporary worsening of symptoms of anxiety and depression was observed (both of a small effect), according to scores on the HADS anxiety and depression subscales. However, again by 12-months follow-up, these scores returned to baseline levels. A 2002 literature review of the validity of the HADS (Bjelland, Dahl, Haug, & Neckelmann, 2002) recommended cut-off scores of 9 and 8 for caseness of clinically significant anxiety and

depression, respectively. According to these guidelines, even at the point when these subscale scores were highest for the present sample, they remained at sub-clinical levels. However, more recent research had indicated that the cut-off score of 8 most commonly used in prevalence studies is not well supported by validation studies with cancer patients and suggests that thresholds of 7 (anxiety subscale) and 5 (depression subscale) may achieve greater sensitivity and specificity (Carey, Noble, Sanson-Fisher, & MacKenzie, 2012; Singer et al., 2009). Interpreted according to these more conservative screening thresholds, the present sample's level of distress approached clinical significance at post-treatment ($M_{\text{HADS-A}}$=7.14) and 6-months follow-up ($M_{\text{HADS-A}}$=7.69; $M_{\text{HADS-D}}$=6.15).

While QoL and emotional distress temporarily worsened, by one-year follow-up, these outcomes had returned to baseline levels. This transient increase in distress may be explained by the fact that the intervention promoted increased self-awareness of (maladaptive) emotions and thoughts, and as described by a number of participants in their PTIs, unveiled longstanding and/or sensitive issues (e.g., feelings of low self-worth, neglect of one's needs/values). Such insight was encouraged while simultaneously encouraging participants to refrain from engaging in their usual coping behaviours (e.g., emotional eating, inactivity) and experiment with new, healthier strategies (e.g., increased self-care, more frequent and varied movement, mindful eating), which may have understandably generated temporary feelings of discomfort or distress. These results are consistent with the program's philosophy that health is the product of continuous small choices and reactionary adjustments that build up over time; it seems that the HLM-ABC program may have helped participants develop mindfulness of, and alternative ways of coping with, the difficult thoughts and emotions that are an inevitable part of life.

The slight temporary increase in distress may also reflect a sense of discouragement that some participants may have felt in reaction to the lack of immediate or more extreme weight loss they may have expected to occur. This phenomenon has been studied in the context of health-related QoL and is termed a "response shift" (Sprangers & Schwartz, 1999; Vallance, Courneya, Plotnikoff, & Mackey, 2008). A response shift refers to the change an individual makes in their own self-evaluation or self-standard, as a result of a change in some measured outcome, such as weight loss. Prior to taking action toward one's goals (or beginning a new program), expectations regarding the degree of effort, pleasure, or benefits involved may be overestimated due to lack of recent or similar experience (Forbes et al., 2017). It is possible that once participants in the HLM-ABC program embarked on their goal (e.g., weight loss) and collected realistic feedback regarding the process involved, they may have learned that the reality was quite different from their expectations, which may have resulted in a more accurate, but upsetting, evaluation of the process and extent of improvement obtainable through their efforts.

The temporary worsening of QoL and psychological distress in this sample at 6-month follow-up (T2) may also be explained by a seasonal effect. The program was implemented in the Spring (between March and May for cohort 1) and the Summer (between May and July for cohort 2), which means that participants' distress was reassessed at T2 in November and January, respectively. Evidence suggests that seasonal increases in sunshine are associated with decreased psychological distress (e.g., Beecher et al., 2016), which could account for the improvement in QoL and distress to baseline levels at the 12-month follow-up (T3) timepoint, when this data was collected again in the Spring and Summer months.

The trend of increased emotional distress at T1 and T2, triangulated with the qualitative feedback regarding a *desire for more interaction from facilitators* (Table 6, 5.2) and the

perception that facilitators *provided emotional support as needed* (Table 6, 5.4), suggests that some participants may benefit from additional phone contact with a facilitator, especially surrounding sensitive topics and/or around the time immediately following the program and six months afterward.

Self-concept. The quantitative results demonstrate that the women in this sample were less distressed about their bodies upon completing the HLM-ABC program and still one year beyond, compared to before starting the program. These data converge with the qualitative finding that several women experienced a positive shift in their relationship with their body following participation (Table 10, 2.2). This increase in self-acceptance occurred in light of perceived physical change for some, and *despite the absence* of perceived physical change for others. This finding is consistent with evidence that engaging in PA for pleasure rather than for weight loss is associated with well-being and improved body image (Homan & Tylka, 2014). This outcome also suggests that in the absence of quantifiable or objective physical measures of improved health, such as weight loss, BCSs can improve their self-concept and still achieve an overall sense of feeling healthier.

Clinical and Research Implications

The role of 'presence' in online learning environments. The HLM-ABC program implemented a number of intentional security features and practices that were intended to preserve group members' confidentiality and reduce the risk of undue harm (i.e., breaching privacy, unintentionally triggering distress in a participant with limited capacity to respond or intervene immediately and effectively). These strategies included use of: an online platform (Moodle@York) with enhanced security features; participants' first names only; absence of visual identifiers such as video media or personally identifying pictures on participants' personal

profiles; as well as a standard format for introductions and weekly discussion that prompted participants to share only certain kinds of information (i.e., diagnosis, treatment history, current goals related to their participation, intervention-specific insights and reactions) presumed to be common amongst all participants and unlikely to cause undue distress. However, the findings suggest that such efforts inadvertently detracted from optimal amounts and quality of personal disclosure and thus had a negative impact on participants' sense of connection with one another. It seems that participants would have appreciated options to bypass security safeguards if doing so could have allowed them to develop a more distinct, individualized online presence/identity and enhanced group engagement.

The findings herein are well situated within existing research in the area of online learning and the concept of "social presence." Social presence was initially defined by Short, Williams, and Christie (1976) as the "degree of salience of the other person in a mediated communication and the consequent salience of their interpersonal interactions" (p. 65). It has also been described as "the ways in which participants 'project their personalities into online discussion'" (Savvidou, 2013; Swan & Shih, 2005). Caspi and Blau (2008) explained that in order for a specific medium (such as the Moodle@York platform) to be perceived as personal, warm, and sociable (thus having acceptable social presence), its participants must "intimately perceive [one another] as a real person" (p.324). This construct has consistently been found to have an influence on participants' satisfaction with online courses (Swan & Shih, 2005), explaining up to 60% of the variance in student satisfaction in one study (Gunawardena, 1995).

Social presence in computer-mediated educational environments is understood to be determined by a number of course elements, including social context (which refers to orientation to course material and learning objectives, impressions of privacy, and social processes), online

communication (the manner in which participants express themselves), and interactivity (reciprocity and immediacy of responses) (Rourke, Anderson, Garrison, & Archer, 2001 Savvidou, 2013; Stacey, 2002; Tu, 2000; Swan & Shi, 2005).

The first of these elements, social context, seems to represent the above-mentioned privacy measures and orienting deliberate safeguards that were built into the program. Consistent with the literature in this area, these factors did appear to impact the current sample's satisfaction with the degree of interaction amidst their group—in other words, their group's social presence.

As mentioned above, the *type* of communication amidst an online learning cohort also has an effect on participants' perception of social presence (Savvidou, 2013; Stacey, 2002). Rourke and colleagues (2013) identified three types of online communication: affective (expression of emotions and personal beliefs, self-disclosure, use of humour), cohesive (expressions that build and sustain a sense of group commitment, including greetings and references to individuals or the group), and interactive (online behaviours that indicate others are attending, including reference and reactions to previous messages).

Swan and Shih (2005) conducted a mixed methods study of how social presence developed in four online graduate courses and found that those students who were categorized as being high in social presence valued interaction with their peers (particularly for the different perspectives this offered), demonstrated greater expression of their feelings and experiences on the online discussion, and were more likely to refer to their peers as a common group. In contrast, those students who were identified as being low in social presence seemed to perceive the interaction as "a waste of time" (p. 130). While all students (both high and low in social presence) acknowledged that they learned from their involvement in group discussion, those low in social presence credited their learning to the process of creating their own responses while those high in

social presence attributed their learning equally to their peers' comments. Interestingly, similar qualitative findings emerged from the present study in participants' positive and negative feedback about the discussion board (*DB afforded different perspectives and vicarious learning, DB a means of self-reflection and consolidation of learning*, *Posting felt like an obligation*, and *Comments from others not considered helpful*). These results suggest that there are individual differences between learners and the ways they communicate online that likely influence their perception of group connection.

The literature surrounding online learning has made a distinction between 'social presence' versus 'teaching presence' (Savvidou, 2013). Teaching presence concerns the visibility of the instructor and stems from the concept of 'immediacy' (Merhabian, 1969), which is the "psychological distance that a communicator puts between themselves and the object of their communication" (Richardson & Swan, 2003, p. 70). Thus, the interaction between instructor and learner (or facilitator and group member) can be qualified as 'immediate' or 'distant'. Teaching presence has been reliably associated with learners' motivation in traditional face-to-face teaching contexts (Allen, Witt, & Wheeless, 2006), and more recently in online learning environments (Baker, 2010; Wise, Chang, Duffy, & del Valle, 2004). One study (Swan & Shih, 2005) found that teaching presence was a stronger predictor of students' perceived learning than was peer presence.

Researchers have posited that instructors achieve a sense of perceived presence in online learning settings through various actions such as fostering consistent patterns of interaction, moderating discussions, providing useful feedback, contributing expert knowledge, and posting on discussion boards to inspire greater interaction when discussion has stalled (Arbaugh & Hwang, 2006; Blignaut & Trollip, 2003; Picciano, 2002). Other research in the context of online

therapy has found that professional facilitators are capable of "humanizing the technology" (Ianakieva, Fergus, Ahmad, Pos, & Pereira, 2016, p. 707) by engaging in specific and deliberate virtual behaviours (e.g., tailoring content and feedback to participants, supplementing text communication with voice contact). These processes, exhibited in online instructors and facilitators, are reflected in the qualitative themes that emerged in the present study regarding acceptability of facilitation; participants perceived their online facilitators to have brought a human presence to the virtual setting, exuded a high degree of competence, strived to promote greater interaction amidst group members, provided valuable individualized feedback, presented questions and alternative perspectives to spur greater communication, and been attuned and responsive to inactivity. These findings, interpreted alongside the relevant literature, further support the conclusion that the facilitation of the HLM-ABC program was acceptable and likely conductive to successful learning outcomes.

Self-determination theory (SDT). Most research in the area of behavioural health change (and weight management specifically) that has studied the role of motivation in successful outcomes has typically done so through manipulation and investigation of *levels* of motivation. For example, the focus tends to be on identification and development of strategies to "increase" and "sustain" motivation (Teixeira, Silva, Mata, Palmeira, & Markland, 2012;Wadden et al., 2006). Teixeira and colleagues (2012) have suggested that examining the *quality* of motivation behind a particular goal (i.e., to lose weight) could offer a more effective approach to the design and study of healthy lifestyle modification interventions. These researchers argue that there is much to be learned about the personal *meanings* people associate with healthier eating and moving, including why some individuals feel that they have failed (and stop engaging) in their efforts when they do not lose a certain amount of weight but otherwise improve their lifestyle.

SDT (Ryan & Deci, 2017), which heavily influenced the HLM-ABC program design, asserts that personal autonomy is a primary factor of motivational quality. Autonomy has been defined as the extent to which a person perceives their actions as being:

> … personally endorsed and engaged in with a sense of choice and volition…as opposed to being associated with a need to comply or with feelings of pressure and tension, often manifested in expressions like, "I should", "I ought to", "I must", etc." (Teixeira et al., 2012)

SDT differentiates between the content of a person's goals (social belonging, personal growth, physical attractiveness) and different reasons for engaging in such goals (to conform, maintain self-esteem, derive pleasure/enjoyment) and posits that when goals are extrinsically motivated, they tend to be regulated by more controlled reasons while intrinsic goals (health, connectedness, personal growth) tend to involve more autonomous forms of motivation and regulation of basic psychological needs (Teixeira et al., 2012). According to SDT, feeling autonomous, challenged yet effective, and meaningfully connected with others are thought to be intrinsically valuable, reinforcing, and self-actualizing.

Throughout the qualitative findings of the present study, there appear to be clear examples of a number of central tenets of SDT. Although not deliberately or formally examined in this study, many of the women's self-reports seem to depict themes related to the *quality* of participants' motivation and ways in which the HLM-ABC program appealed to their basic needs for autonomy, competence, and relatedness. For example, P14's quote presented on p. 86 highlights how the intervention appealed to her inherent wisdom and freedom of choice, and thereby promoted self-accountability:

> It was really nice to just have somebody distill the information in a way that didn't feel like preaching [or 'controlled', from a SDT lens])…Like here's the information I'm going to present to you, and the message I found all the way throughout was that the onus was on us to incorporate it the best way possible [promoting feelings of competence and

> autonomy]. It didn't feel like scripted, you need to do A B C D and E. It was very much, here's the information, take from it what you will and incorporate it. I think that was kind of the really big take home, was that you can only incorporate so much as you can handle, and everybody's lifestyle means that they can handle something different.

These quotes also seem to depict a shift that occurred for some women in the quality of their motivation. For example, the woman (P11) quoted on p. 141 described having made meaningful changes in her behaviour as a result of shifting her locus of motivation from one of extrinsic pressure (to lose weight and perform excessively at work) to one of intrinsic goals (for self-care and personal enjoyment):

> I made a decision to take a leave of absence from work, which was really hard to do but I know that it was a huge act of self-love… It was kind of like, "wait a minute…even though I know what I enjoy doing, I'm not doing it because there's literally no time in the day when I can do it." … I found the program beneficial… although the modification wasn't weight loss, there definitely was some modification… I think because it was structured and because there was some accountability—and it wasn't a threatening accountability piece—it was just that you understood that it was *self*-serving, it benefited *you*. So that was kind of a nice thing. I've been on other kind of programs in the past where the accountability piece was kind of like, 'oh I've got to hit this goal out of fear' kind of thing [extrinsic, controlled motivators], where this was like, 'I've got to hit this goal because it's *my* goal. This is what I want to do. This is how I want to change.' So, it was kind of a bit more self-directed that way.

The ways in which these manifestations of SDT are evident in the data, in participants' own words, also suggest that participants very much internalized and embodied the essence of the program in a way that is likely to be lasting. This offers additional support for SDT as a valid model for behavioural change and implies that the HLM-ABC tenets resonated with and were readily adopted by at least some of these women. Future lifestyle modification programs would likely benefit from incorporating strategies to engage participants' universal needs for autonomy, competence and relatedness and aim to connect these needs to program goals. Given the great deal of overlap between SDT and MI principles, Patrick and Williams (2012) have proposed that MI techniques offer clinicians specific and practical methods by which to apply the more

theoretical abstract concepts of SDT in health settings. Future research in this area should also aim to assess not only *levels* of motivation but also the *quality* of participants' motivation and underlying reasons for engaging in such efforts.

A weight inclusive approach to health. Although participants in the current study achieved varying degrees of weight loss (and two gained weight), they also demonstrated improvements (varying from small to large magnitude) in other domains of health and well-being, including intuitive eating, PA level, motivation, nutrition self-efficacy, and body image distress. In addition to these quantitative outcomes, the women qualitatively described themes of increased self-awareness, feelings of empowerment and self-efficacy, increased skillfulness with respect to how to approach their health goals, and enhanced self-acceptance. Triangulation of these mixed-method findings suggests that positive behavioural, emotional, and attitudinal health changes can occur even when physical outcomes (i.e., weight loss) are modest.

Mainstream research and health care tend to conceptualize health according to quantifiable outcomes (e.g., BMI, muscle mass, measures of body circumference, biomarkers), with weight being a primary indicator. However, this medicalized approach to health has been criticized by proponents of a 'weight-inclusive' (versus 'weight-normative') approach to health (Tylka et al., 2014). Among the problems associated with a weight-centric system are: weight-cycling and its related adverse health impacts including increased mortality, heightened risk of bone fractures and gallstones, muscle atrophy, hypertension, chronic inflammation, and some forms of cancer (Lissner et al., 1991, Nilsson, 2008; Rzehak, Meisinger, Woelke, Brasche, Strube, & Heinrich, 2007; Tylka et al., 2014); failure to diagnose legitimate health conditions in individuals whose weight appears 'normal; false diagnosis and prescription of weight loss interventions for individuals who are considered 'overweight' but are otherwise healthy (Tylka et al., 2014);

establishment of weight goals that are often impossible or unsustainable that generate chronic feelings of failure and shame (Bacon, Stern, Van Loan, & Keim, 2005; Jeffery et al., 2000; Wing & Phelan, 2005); absence of empirical evidence that a higher BMI actually *causes* poor health (Bruno, 2017); and harmful stigma presenting within oneself, between individuals and their health care providers, and amidst society at large. Furthermore, a weight-normative approach to health fails to account for the range of factors that can influence a woman's body weight and shape that are beyond her control (e.g., genetics, age, hormonal status, metabolic functioning, disease- and/or treatment-related weight gain, surgical body changes) and can therefore impede her sense of autonomy and competence with respect to managing her own health—experiences that are considered fundamental to motivation and self-efficacy (Ryan & Deci, 2017).

A weight-inclusive approach is based on "the assumption that everybody is capable of achieving health and well-being independent of weight, given access to non-stigmatizing health care" (Tylka et al., 2014, p. 6). One formalized model of this approach is Health at Every Size (HAES), trademarked and defined by the Association for Size Diversity and Health (ASDAH) (Bruno, 2017; Gingras, Brady, & Aphramor, 2014). The HAES model acknowledges that while associations have been established between weight and illness, there is even stronger evidence linking other factors with health (e.g., genetics, environmental history, biological 'set points', socioeconomic status, access to affordable food and other resources) (Tylka et al., 2014). Similar to the HLM-ABC program, HAES adopts a holistic definition of health that includes QoL, which is recognized as essential to physical and psychological well-being.

Several studies have investigated the effectiveness of weight-inclusive interventions (primarily the HAES model) compared to weight-normative models. One review of six such studies found that the HAES interventions yielded statistically and clinically significant

improvements in blood pressure, PA, self-esteem and disordered eating; these outcomes were achieved with greater success and less attrition than those interventions that emphasized dieting (Bacon & Aphramor, 2011; Tylka et al., 2014). One study in particular (Bacon et al., 2005) evaluated a HAES-informed program that emphasized intuitive eating and body acceptance against a dietary weight loss program with women who were overweight or obese. The results of this investigation were that the HAES program yielded lower levels of cholesterol, triglycerides, low-density lipoprotein, blood pressure, and led to improvements in disinhibited eating, bulimic-like symptoms, awareness of internal sensations, body dissatisfaction, depressive symptoms, and self-esteem (Bacon et al., 2002; Bacon et al., 2005). These improvements persisted at two-years follow-up. In comparison, the diet intervention yielded weight loss and initial improvements on a number of the same outcomes by one-year follow-up, but these changes were not sustained at 2-years follow-up (Bacon et al., 2005). Contrary to the women in the HAES program, those who participated in the diet program experienced a *decrease* in self-esteem.

To date, no studies have explored the application of a HAES (or other explicitly identified "weight-inclusive") intervention with overweight/obese BCSs. The similarities between this model and the HLM-ABC program offers preliminary support for the benefits of implementing holistic, weight-inclusive approaches to help women with a history of BC manage their health long-term during the survivorship period. Future research in this area is warranted.

Study Limitations

A major limitation of the present study is its small sample size. Given that the findings herein are based on data from only 14 individuals, the results cannot be generalized to, or considered representative of, all BCSs who are overweight or obese and seeking to make changes to their weight and/or overall lifestyle during the survivorship period. Given the size of

this sample, the data were not amenable to statistical analyses that carry assumptions of normality and adequate power. Therefore, the current study was limited to exploratory analyses and reporting of effect sizes to estimate the magnitude of the HLM-ABC intervention's potential. Notwithstanding the limits of the quantitative results, it can be argued that a small sample size was appropriate for the current study's purpose and aims. Small sample sizes are common for the purposes of phase I trials or pilot studies, wherein the purpose is not to generalize findings but rather to trial feasibility and acceptability of novel interventions and estimate effect sizes, power, and sample size for later-phase trials. Taking a step-wise research approach such as this is advisable according to Consolidated Standards of Reporting Trials (CONSORT) guidelines (Eldridge et al., 2016) and ensures that resources are not unnecessarily invested and participants not unduly recruited prior to determining that doing so is warranted, feasible, and ethical (Bowen et al., 2009).

Another limitation of this sample is its lack of diversity. Although the sample represented a wide range in age (29 to 71 years) and annual income, the majority self-identified as White/Caucasian (nearly 79%) and as having a university-level education (64%) therefore cannot be assumed to reflect the experiences of BCSs of various cultural and educational backgrounds.

A further limitation of the current study is that the same investigator designed the HLM-ABC program, was the lead co-facilitator during implementation of the intervention, and was the primary data analyst. It is undeniable that having this continuous and comprehensive vantage point of the study shaped the way in which the investigator engaged in the various study procedures. For instance, during the analysis phase, the PI's interpretation of the qualitative data (i.e., participants' subjective reports of their experience in the program) was, to varying degrees of consciousness, influenced by her own subjective experience of developing and delivering the

program, as well as interacting with the participants. A number of efforts were taken to account for potential inherent biases, including making explicit the research-clinician's assumptions in the Method section. Furthermore, the statistical analyses were conducted in consultation with a biostatistician who was in no other way affiliated with the study or study sites (SHSC and York University). Additionally, the interviews that were conducted with participants after completing the program were conducted by a third-party RA who was also not involved in the study in any other manner. During these interviews, participants were encouraged to share their feedback about the program and facilitators candidly, and were asked directly for suggestions for improvement. Finally, qualitative analysis was conducted in consultation with the PI/author's dissertation supervisor with the intent of increasing trustworthiness and validity of the findings. Despite these attempts to minimize the influence of clinician effects and of overlapping researcher-clinician roles, it would be important to evaluate the HLM-ABC program on a larger scale, implemented by different clinicians. This would allow for greater mitigation of clinician bias and assessment of the replicability of the study thereby to determine that any meaningful effects of the program are indeed attributable to the intervention itself.

Conclusions

Overall, the HLM-ABC program was found to be feasible to implement, as demonstrated by acceptable rates of recruitment, attrition, and homework completion, and discussion board interaction. The program was also deemed acceptable, with participants reporting relative greater satisfaction with the program philosophy, content, and facilitation and lesser satisfaction with the online Moodle@York platform and the capacity for personalized group interaction (i.e., social presence) related to excessive efforts to protect individuals' anonymity and privacy.

This study took a 'weight inclusive' approach to evaluating the program's preliminary effectiveness. This involved triangulation of various physical, behavioural, and psychosocial outcome data to determine whether the intervention was successful in supporting sustained (i.e., one-year follow-up) improvements in a number of health indicators (as opposed to relying exclusively or unduly on weight). Results demonstrated quantitative and qualitative trends of sustained but modest weight loss, increased intuitive eating, higher levels of PA, increased motivation and self-efficacy (regarding eating habits), and improved body image.

The preliminary effectiveness of the HLM-ABC pilot program is quite promising in light of the fact that it was a relatively self-directive, at-home intervention that did not impose restrictions or strict prescriptions. In other words, the HLM-ABC program did not so much instruct participants on *what* to do to establish a healthy lifestyle, but rather taught principles and practices for how to develop healthier lifestyle habits that suit each woman's unique situation, needs and preferences. The content and principles embodied by this program have the potential to be transferred and adapted to different populations, cultures, and settings and therefore may represent a helpful adjunct to other, standard, health care interventions. Future research could examine the utility of condensing the most valuable aspects of the program (e.g., learning about self-'sabotaging' internal dialogue and behaviours, developing more intuitive eating habits) and packaging them in a digestible format that can be readily implemented by clinicians seeking to adopt a non-stigmatizing, health-inclusive approach to supporting their patients in establishing healthier habits.

Also promising is the finding that this program was acceptable to participants despite the limitations in user-friendliness and functionality of the website it was delivered via. It is likely that the acceptability and usability of the intervention could be even greater if it were to be

implemented with more sophisticated, customized technology. The sustained effects of many of the outcomes also differ from the trend that is often found with diet and exercise interventions that yield immediate outcomes that are rarely sustained, or lack follow-up data altogether. These results suggest that the HLM-ABC pilot program has potential to help BCSs adopt and maintain a healthier lifestyle.

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Appendix A: Informed Consent to Participate in a Research Study

Full Study Title: A Pilot Study Evaluating the Effectiveness of an Online Lifestyle Intervention for Healthy Weight Management and Improved Quality of Life in Breast Cancer Survivors

Principal Investigator: Karen Fergus, PhD, C. Psych, Patient and Family Support, Sunnybrook Odette Cancer Centre, 416-480-5000 x1243

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Sponsor: This study is being funded by the Canadian Breast Cancer Foundation.

INFORMED CONSENT

You are being asked to consider participating in a research study. A research study is a way of gathering information on a treatment, procedure or medical device or to answer a question about something that is not well understood.

This form explains the purpose of this research study, provides information about the study, the tests and procedures involved, possible risks and benefits, and the rights of participants.

Please read this form carefully and ask any questions you may have. You may have this form and all information concerning the study explained to you. If you wish, someone may be available to verbally translate this form into your preferred language. You may take as much time as you wish to decide whether or not to participate. Feel free to discuss it with your friends and family, or your family doctor. Please ask the study staff or one of the investigator(s) to clarify anything you do not understand or would like to know more about. Make sure all your questions are answered to your satisfaction before deciding whether to participate in this research study.

Participating in this study is your choice (voluntary). You have the right to choose not to participate, or to stop participating in this study at any time.

INTRODUCTION

You are being asked to consider participating in this study because you have been diagnosed with primary breast cancer (Stages I-III), have completed active treatment within the past five years, and consider yourself to be overweight or have gained 10 or more pounds post-treatment. Because maintaining a healthy weight is important for breast cancer survivorship, there is a need to develop strategies and supports for women to help with the process of weight loss and healthy weight management post-treatment. This study will implement a 12-week online group intervention designed to address diet and exercise, along with other psychosocial issues related to survivorship such as psychological distress, fatigue, body image concerns, and social support.

WHY IS THIS STUDY BEING DONE?

The purpose of this study is to develop an effective, widely accessible and convenient online group-based lifestyle intervention that helps breast cancer survivors sustain weight loss and improve their physical well-being.

WHAT WILL HAPPEN DURING THIS STUDY?

Participants in this study will take part in a 12-week online program that will involve logging in regularly to a secure website to access learning materials, complete corresponding exercises, and engage in therapist-led discussion with your fellow group members about the session content and your relevant personal experiences. Information shared via the website, including group dialogue and homework assignments, will be saved and stored as a password-protected file on a password-protected computer that only the group facilitators and co-investigator will have access to.

HOW MANY PEOPLE WILL TAKE PART IN THIS STUDY?

It is anticipated that about 30 people will participate in this study, and recruitment will be through the Sunnybrook Louise Temerty Breast Center and announcements in the Greater Toronto Area. The length of this study for participants is about 15 months in total (3 months for the intervention, with the completion of additional questionnaires at 6 and 12-months following completion of the program). The entire study is expected to take about 3 years to complete and the results should be known in 3.5 years.

WHAT ARE THE RESPONSIBILITIES OF STUDY PARTICIPANTS?

If you decide to participate in this study you will be asked to do the following:

Screening Interview
The Screening Interview will take approximately one hour to complete. This information will enable us to determine if you are eligible to participate in the study.

During the Screening Interview, you will be asked to answer questions about your medical history, weight, accessibility to transportation to and from the study site, access to a computer and the Internet, as well as your readiness to engage in physical activity. Please note that you have the choice of not answering any questions should you not want to.

You may not take part in this study unless you have been diagnosed with non-metastatic breast cancer, have completed treatment within the previous 5 years, and consider yourself to be overweight/obese (BMI>25 or an increase in weight ≥ 10 pounds since completing treatment).

Baseline Measures
Once enrolled in the study you will be asked to visit the Louise Temerty Breast Center to complete your baseline questionnaire package, which includes a set of surveys about your eating and exercise habits, quality of life, mood, body image, and beliefs about the program's potential and your own abilities to reach your goals. As part of this first visit, you will also have your

weight, height, and waist circumference measured. In total, this visit will take up to one hour to complete.

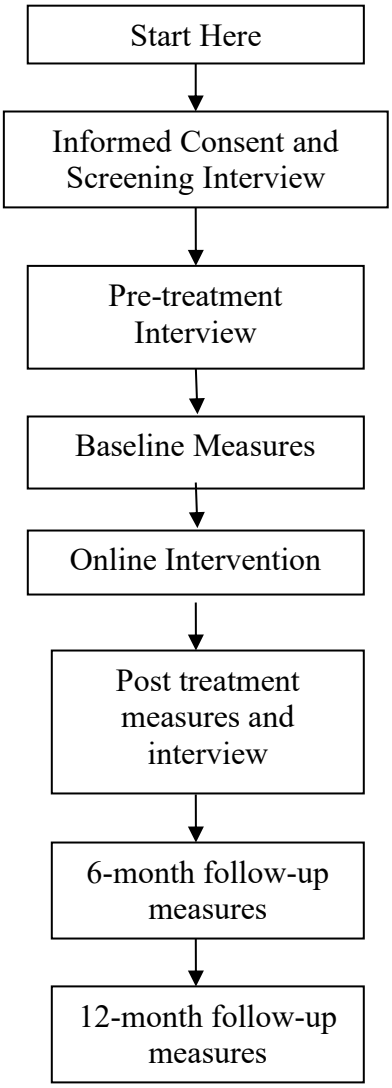
Pre-treatment Interview
Next, you will be asked to take part in a pre-treatment interview that will last approximately one hour. During this interview, you will be introduced to one of your group leaders, who will describe in more detail how the program will unfold week to week, as well as ask you questions about your past and current health patterns, personal promoters and barriers to maintaining a healthy lifestyle. This information will inform group discussion as well as the development of your individualized lifestyle goals.

Intervention
Once enrolled in the program, you will be provided with a secure login and password to join a private discussion group on the website: 'Moodle@Yor*k.*' You will use your personal login to access weekly learning materials, engage in text-based group discussion, and complete and submit weekly 'homework' assignments. Your engagement will involve logging in to the website at least twice (but ideally more) per week, for the duration of the 12-week program to read psychoeducational 'lesson' materials, use the online forum to participate in therapist-led group discussion about session content and your related experiences, and submit weekly homework assignments that correspond with that week's topic and teaching concepts. Throughout this program, you will continually develop and pursue your own personal health goals with the support of your two online facilitators and fellow group members, as well as through the guidance of scientifically-informed exercises that will help you experiment with small, gradual changes to your daily behaviours (e.g., eating habits, physical activity), thinking patterns (e.g., practicing more helpful, self-compassionate self-talk), and attention (e.g., becoming more aware of your body's physical sensations and emotional experiences).

Post-Treatment, 6-Month Follow-Up and 12-Month Follow-Up Measurements
Once you have completed the program, you will be asked to visit the Louise Temerty Breast Centre again to fill out the same set of questionnaires that you completed prior to beginning the program about your eating and exercise habits, quality of life, mood, body image, and beliefs about your own abilities to reach your goals. At this visit, you will also have your weight, height and waist circumference measured again. You will be asked to make two more visits to the Louise Temerty Breast Centre again 6 and 12 months later (follow-up), to complete the same questionnaires and physical measurements. Each of these visits will take up to one hour to complete.

Post-treatment Interview
You will also be asked to take part in a post-treatment interview after completing the program. You will be asked questions about your involvement in the study, particularly what you found to be most and least helpful. You will also be asked for feedback regarding how the intervention may be improved or refined in the future. This interview will take up to one hour to complete and may be audio recorded.

Another way to find out what will happen during this study is to read the study plan below. Start reading at the top and read down the list, following the arrows.


Start Here
Informed Consent and Screening Interview
Pre-treatment Interview
Baseline Measures
Online Intervention
Post treatment measures and interview
6-month follow-up measures
12-month follow-up measures

CALENDAR OF VISITS

Boxes marked with an X show what will happen at each time point.

Event	Time	Written Informed consent	Telephone Interview	Paper-Pencil Questionnaire	Height, weight, waist-circumference
Screening Interview	60mins		X		
Pre-treatment Interview	60 mins		X		
Baseline Measures	60 mins	X		X	X
Post-treatment Measures	60 mins			X	X
Post-treatment Interview	60 mins		X		
6-month follow-up Measures	60 mins			X	X
12-month follow-up Measures	60 mins			X	X

WHAT ARE THE RISKS OR HARMS OF PARTICIPATING IN THIS STUDY?

The potential risks associated with participating in this study are minimal and strategies have been put in place to mitigate these risks. You will have been screened over the telephone to assess your readiness/suitability to engage in physical activity prior to beginning the program and will have discussed any individual concerns regarding safe physical activity with your family doctor. Nevertheless, there is a minimal risk that you might experience physical pain or injury during exercise.

There is also the potential for you to become uncomfortable during the intervention group while discussing your experiences with breast cancer and its impact on your psychological, social and physical health. The facilitators for the group do their best to create a safe environment where such feelings can be explored in ways that are supportive. However, bear in mind that you will determine the extent of participation in the group and you always have the option to be less involved or remove yourself from the group if that seems to be the most appropriate action. Additionally, you may disclose information that may identify people or facilities. Out of respect for individuals' privacy, the facilitators will encourage participants to refrain from using names. All names and identifiers will be deleted during the transcription process. Transcription is taking the words and dialogue on the audio/video tape and writing or typing it word for word. Additionally, during the discussion group, the moderator will remind participants that the information shared is private and should not be repeated outside the group.
You will be told about any new information that might reasonably affect your willingness to continue to participate in this study as soon as the information becomes available to the study staff.

WHAT ARE THE BENEFITS OF PARTICIPATING IN THIS STUDY?

You may or may not benefit directly from participating in this study. However, if you participate in one of the intervention groups, possible benefits include weight loss, increased quality of life, improved mood, more positive body-image, self-esteem, social support, and increased knowledge in healthy lifestyle management. Your participation may or may not help other people with breast cancer in the future.

WHAT OTHER CHOICES ARE THERE?

If you decide not to participate in this study, other treatment choices may be available. These may include: independent diet and exercise, consultation with your family physician or other medical professionals (e.g. dietician), alternative structured weight loss programs, or not doing anything at all. This list is not exhaustive, and if you are interested, you can further discuss these treatment options with the investigator(s) before deciding whether to participate in this study.

CAN PARTICIPATION IN THIS STUDY END EARLY?

The investigator(s) may decide to remove you from this study without your consent for any of the following reasons:
The investigator(s) decide(s) that continuing in this study would be harmful to you
You plan to undergo a medical procedure during the duration of the study
You plan to participate in another structured weight loss program or take weight loss medication during the duration of the study
You are unable or unwilling to follow the study procedures
You develop a medical condition that is not successfully managed/treated
You develop metastatic breast cancer or enter active cancer treatment

If you are removed from this study, the investigator(s) will discuss the reasons with you and plans will be made for your continued care outside of the study.

You can also choose to end your participation at any time without having to provide a reason. If you choose to withdraw, your choice will not have any effect on your current or future medical treatment or health care.
If you withdraw voluntarily from the study or at the request of your family doctor, you are encouraged to contact Dr. Karen Fergus immediately, at Department of Psychology, Sunnybrook Odette Cancer Centre, 2075 Bayview Avenue, Toronto, Ontario, M4N 3M5, karen.fergus@sunnybrook.ca.

If you withdraw your consent, the information about you that was collected before you left the study will still be used. No new information about you will be collected without your permission.

WHAT ARE THE COSTS OF PARTICIPATING IN THIS STUDY?

Participating in this study may result in added costs to you for parking and transportation.

WHAT HAPPENS IF I HAVE A RESEARCH RELATED INJURY?

If you become sick or injured as a direct result of your participation in this study, your medical care will be provided. Financial compensation for such things as lost wages, disability or discomfort due to this type of injury is not routinely available.

By signing this consent form, you do not give up any of your legal rights.

ARE STUDY PARTICIPANTS PAID TO PARTICIPATE IN THIS STUDY?

You will not be paid to participate in this study.

HOW WILL MY INFORMATION BE KEPT CONFIDENTIAL?

You have the right to have any information about you and your health that is collected, used or disclosed for this study to be handled in a confidential manner.

If you decide to participate in this study, the investigator(s) and study staff will look at your personal health information and collect only the information they need for this study. “Personal health information” is health information about you that could identify you because it includes information such as your;

- name,
- address,
- telephone number,
- date of birth,
- new and existing medical records, or
- the types, dates and results of various tests and procedures.

You have the right to access, review and request changes to your personal health information. The following people may come to the hospital to look at your personal health information to check that the information collected for the study is correct and to make sure the study followed the required laws and guidelines:

Representatives of the Sunnybrook Research Institute, Sunnybrook Health Sciences Centre, the Sunnybrook Research Ethics Board, or the Ontario Cancer Research Ethics Board, because they oversee the ethical conduct of research studies at Sunnybrook

Access to your personal health information will take place under the supervision of the Principal Investigator.

“Study data" is health information about you that is collected for the study, but that does not directly identify you. This data will include video-recorded and transcribed discussions that take place in either the face-to-face, or online, group sessions. You will not be identified by name on any document and your identity will remain confidential.

Any study data about you that is sent outside of the hospital will have a code and will not contain your name or address, or any information that directly identifies you.

Study data that is sent outside of the hospital will be used for the research purposes explained in this consent form.

The investigator(s), study staff and the other people listed above will keep the information they see or receive about you confidential, to the extent permitted by applicable laws. Even though the risk of identifying you from the study data is very small, it can never be completely eliminated.

The Principal Investigator will keep any personal health information about you in a secure and confidential location for 10 years and then destroy it according to Sunnybrook policy.

When the results of this study are published, your identity will not be disclosed. The findings will be published in academic journals and presented to professional and general audiences. It is possible that word-for-word excerpts from your discussions and comments may be used in presentations and reports. Were this to occur, your identity would be concealed and protected. However, it is possible that you (or people who know you well) might recognize words-in-print or spoken in a presentation as belonging to you.

You have the right to be informed of the results of this study once the entire study is complete. If you would like to be informed of the results of this study, please contact Dr. Karen Fergus, at Department of Psychology, Sunnybrook Odette Cancer Centre, 2075 Bayview Avenue, Toronto, Ontario, M4N 3M5, karen.fergus@sunnybrook.ca.

A description of this clinical trial will be available on *http://www.ClinicalTrials.gov*, as required by U.S. Law. This Web site will not include information that can identify you. At most, the Web site will include a summary of the results. You can search this Web site at any time.

HOW WILL THE INFORMATION I SHARE ONLINE BE KEPT PRIVATE AND CONFIDENTIAL?

Moodle@York is a platform that is securely installed and accessed through York University's Learn@York services, which caters to authenticated members or affiliates of York University (which the investigators of this study are) by assigning them a secured "PassportYork" login. Logging into Moodle@York with a secured Passport York login encrypts usernames and passwords before transmitting them across the Internet. Another security feature of Moodle@York is that users can only be granted access to the online intervention group and 'course' contents if the group facilitators individually add them. This feature allows for enhanced control and confirmation of group membership. Furthermore, in order to promote confidentiality, Moodle@York is designed so that only group facilitators can see homework assignments that members have submitted. While discussion forums can be seen by all group members, they will be informed about the importance of maintaining confidentiality and instructed not to disclose any personally identifying information, and to limit their introductions and usernames to first names only (or to use pseudonyms if preferred). They will also be instructed that, despite these

preventative measures, should they learn of another user's sensitive or personally identifying information, to not share this with anyone outside of the group. Finally, Learn@York operates under the UIT/YorkU domain, which has excellent protection against hacks on the server level. To ensure protection against hacks at the user level, participants will be instructed on best online practices, including saving their login ID and passwords somewhere private, and accessing the website on personal, rather than public, computers.

DO THE INVESTIGATORS HAVE ANY CONFLICTS OF INTEREST?

There are no conflicts of interest to declare related to this study.

COMMUNICATION WITH YOUR FAMILY DOCTOR

Your family doctor may be informed that you are taking part in this study so that your study coordinators and family doctor can help you make informed decisions about your medical care.

WHAT ARE THE RIGHTS OF PARTICIPANTS IN A RESEARCH STUDY?

You have the right to receive all information that could help you make a decision about participating in this study. You also have the right to ask questions about this study and your rights as a research participant, and to have them answered to your satisfaction, before you make any decision. You also have the right to ask questions and to receive answers throughout this study.

If you have any questions about this study you may contact the person in charge of this study, Dr. Karen Fergus, Department of Psychology, Sunnybrook Odette Cancer Centre, 2075 Bayview Avenue, Toronto, Ontario, M4N 3M5, karen.fergus@sunnybrook.ca.

The Sunnybrook Research Ethics Board has reviewed this study. If you have questions about your rights as a research participant or any ethical issues related to this study that you wish to discuss with someone not directly involved with the study, you may call the Chair of the Sunnybrook Research Ethics Board at (416) 480-6100 ext. 88144.

DOCUMENTATION OF INFORMED CONSENT

You will be given a copy of this informed consent form after it has been signed and dated by you and the study staff.

Full Study Title: A Pilot Study Evaluating the Effectiveness of an Online Lifestyle Intervention for Healthy Weight Management and Improved Quality of Life in Breast Cancer Survivors

Name of Participant: _____

Participant/Substitute decision-maker

By signing this form, I confirm that:

This research study has been fully explained to me and all of my questions answered to my satisfaction

I understand the requirements of participating in this research study

I have been informed of the risks and benefits, if any, of participating in this research study

I have been informed of any alternatives to participating in this research study

I have been informed of the rights of research participants

I have read each page of this form

I authorize access to my personal health information, medical record and research study data as explained in this form

I have agreed, or agree to allow the person I am responsible for, to participate in this research study

I understand that my family doctor may be informed of my participation in this research study

This informed consent document may be placed in my medical records

_____	_____	_____
Name of participant/Substitute decision-maker (print)	Signature	Date

ASSISTANCE DECLARATION

Was the participant assisted during the consent process? ☐ Yes ☐ No

☐ The consent form was read to the participant/substitute decision-maker, and the person signing below attests that the study was accurately explained to, and apparently understood by, the participant/substitute decision-maker.

☐ The person signing below acted as a translator for the participant/substitute decision-maker during the consent process. He/she attests that they have accurately translated the information for the participant/substitute decision-maker, and believe that that participant/substitute decision-maker has understood the information translated.

_____	_____	_____
Name of Person Assisting (Print)	Signature	Date

Person obtaining consent

By signing this form, I confirm that:

This study and its purpose has been explained to the participant named above

All questions asked by the participant have been answered

I will give a copy of this signed and dated document to the participant

_____	_____	_____
Name of Person obtaining consent (print)	Signature	Date

Statement of Investigator

I acknowledge my responsibility for the care and well being of the above participant, to respect the rights and wishes of the participant as described in this informed consent document, and to conduct this study according to all applicable laws, regulations and guidelines relating to the ethical and legal conduct of research.

_____	_____	_____
Name of Investigator (print)	Signature	Date

Appendix B: Study Information and Screening Questionnaire

Informed Consent:
"I will now review with you a brief description of the Informed Consent form, which you will review more fully and receive a copy of when you complete your first set of questionnaires, should you be eligible for the study, and then should you choose to participate in this study. Please feel free to stop me at any time if you have any questions"

Brief review of informed consent form:
(1) *Purpose of study*: To develop an effective group-based lifestyle intervention that helps breast cancer survivors sustain weight loss and improve their quality of life. A secondary aim is to demonstrate that such a group can be successfully delivered through the Internet.

(2) *Participant responsibilities*:
If eligible to participate, you will be asked to engage in a pre-treatment interview over the telephone during which you will be asked questions about your past and current health patterns, as well as things that help or interfere with your maintaining a healthy lifestyle.
After completing this pre-treatment interview and being set up with a login to the group website, you will be asked to come to the Odette Cancer Centre at Sunnybrook Health Sciences to meet with one of our dieticians so she can take the measurements (weight, waist circumference) And also, you will be asked to complete a set of questionnaires pertaining to your eating and exercise habits, your perceived quality of life, mood, body image, and beliefs about your own abilities to reach your goals. You will be asked to meet with the dietician and complete these questionnaires on four separate occasions: (1) prior to commencing in the program, (2) immediately after completing the program, (3) six months after the completion of the program, and (4) twelve months after the completion of the program. The first set of questionnaires will also include a a consent form to sign and about 8 to 10 separate, but brief questionnaires.
After completing your first set of questionnaires and measures, you will begin the online intervention. This will involve 12 weeks of participating in a psychoeducational group program, completing practical exercises or homework between sessions, and engaging in online group discussion. The last two sessions are designed as 'booster' sessions, which will allow you to check in with each other about your progress and receive ongoing support in reaching your goals.
After completing the online intervention, you will be asked to take part in an audio-recorded post-treatment interview. The purpose of this interview is to obtain feedback about your experience modifying your lifestyle and ideas about how to improve the program going forward.

3) *Privacy and use of information:* Not identified by name on questionnaires or transcripts. The website for the online group is encrypted and password protected, and group members will be instructed to use only first names or pseudonyms. They will also be informed about the importance of maintaining confidentiality of their fellow group members. The results of this study will be used to determine if the program is helpful, and the findings will be published in academic journals and presented to professional and general audiences with no identifying information.

(4) *Harm and benefits:* You may or may not benefit directly from participating in this study. If you experience an increase in distress, which is unlikely over the course of the program, you will have the option of referral to a therapist.

(5) *Discontinuing program at any time:* You are free to discontinue participating in the above stated project at any time you choose with no effect on your health care or refuse to answer or participate in any particular aspect of the study.

(6) *Participant rights:* (a) have a copy of the consent form, (b) participation is voluntary, you can withdraw from program at any time, (c) to significant program information and ask questions and have them answered sufficiently to make a decision regarding participation or continued participation, (d) told of any new information that might affect willingness to participate, (e) collected personal information will be kept confidential and protected to the fullest extent of the law, (f) to request changes to your personal information, and (g) to be informed of the results of this study.

If you have questions about your rights as a research participant you may contact the Chair of the Sunnybrook Research Ethics Board at 416-480-6100 ext. 88144.

Given what you've learned so far about the project, are you still interested in participating?
[If 'no' – thank individual for their time and simply state that there won't be any need to send ICF to them]
[If 'yes' – "Ok so the next step is to make sure that you meet the criteria for the study. So I will need to ask you some questions to determine this."]

Screening Questionnaire:

Screened By: _____ Eligible? Y/N If no, reason: _____

Participant Study ID: _____

"So during this time, I am going to be asking you a series of questions to ensure the program is a good fit for you. Before we begin, do you have any questions for me?"

General Screen

How old are you? _____
Exclusion Criteria: Women younger than 21 years of age

Program Intentions/Expectations

How did you hear about this study? _____
_____
_____
What prompted you to agree to learn more?
_____
_____

Study Time Commitment & Scheduling Conflicts

I am now going to remind you, and provide you with a bit more information, about what will be required of you, should you be eligible to participate in this study. Firstly, you would next be asked to take part in an approximately hour-long pre-group interview with one of your group leaders, Dana. The purpose of this interview is to introduce you to Dana, communicate more details about what you can expect from the program, as well as what is expected on your end, and finally to ask some questions about your current and past diet and exercise behaviour as a baseline before trying to make some changes through this program. Once the program begins, will be expected to participate in a 12-week online program that will involve logging in regularly to a secure website to access learning materials in the format of PowerPoint slides (query if they are familiar with PP or have access to MS Office), complete corresponding homework exercises, and engage in therapist-led discussion with your fellow group members about the session content and your relevant personal experiences. You will also be required to visit Sunnybrook Health Sciences Centre to complete a questionnaire package and have your body measurements taken at 4 separate times: (1) before the group begins, (2) immediately after completing the group, (3) 6 months after you have completed the group, and (4) 12 months after you have completed the group. In total, each visit will take up approximately one hour to complete (measurements + questionnaires). Finally, you will be asked to take part in an hour-long audio-taped interview after completing the program to help us obtain feedback about the program.
Your overall commitment in the program will involve approximately 90 minutes a week for twelve weeks, plus additional time spent exercising on your own outside of the group. The

questionnaire and physical measurement portion of this study will span over 15 months time. Does this sound like something to which you can commit? YES/NO

Do you have any upcoming vacations scheduled or anything upcoming that may make it so you temporarily cannot participate in this study for more than one week's time?
YES/NO_____

Computer Screen & Online Access
Do you have a computer with regular Internet access at home or somewhere that's sufficiently private that you would feel comfortable using the study website?
YES/NO
Exclusion Criteria: Participants who do not have convenient and private access to a computer with a reliable internet connection in a sufficiently private setting.

Are you comfortable using a computer and connecting to the Internet? YES/NO
If no: Explain that this in a criteria for entry into the study (and reasons why)

Do you have any difficulty with written or spoken English? YES/NO
Exclusion criteria: Participants who have sufficient difficulty speaking or writing in English that it would interfere with their ability to engage in and benefit from the intervention.

Diagnosis Screen
What is your diagnosis?_____
Exclusion Criteria: Women diagnosed with metastatic breast cancer.

When were you diagnosed? _____

What treatment did you receive (surgery/chemo/radiation/hormones)?
_____
_____

Have you completed active treatment? How long ago did you complete your treatment?
_____
Eligibility Criteria: Women who have finished treatment within the last 5 years.

How much do you weigh? How tall are you? _____

Have you gained weight since the beginning of your breast cancer treatment? If so, how much weight have you gained? _____
Eligibility Criteria: BMI (kg/m2) ≥ 25 OR ≥10 lbs. weight gained since beginning treatment
Do you have access to transportation to and from Sunnybrook Health Sciences Centre?
Exclusion criteria: Participant does not have access to transportation to the study site for purposes of measurement.

Exclusion criteria: Participant responds "yes" to any of the following:
Do you have a medical condition, such as diabetes, cardiovascular or respiratory disease, or hypertension, that is not being successfully managed or treated? YES/NO

Are you planning to undergo a major medical procedure during the next year? YES/NO

Are you currently taking, or planning to take in the next year, any weight loss medication? YES/NO

Are you currently participating, or planning to participate in the next year, in any formal weight loss program other than this one? YES/NO

Are you currently participating, or planning to participate in the next year, in any other research study other than this one? YES/NO

Mental Health Screen

Exclusion Criteria: All participants will be screened for mental illness that may interfere with their capacity to benefit from the program (e.g. suicidality, psychotic disorders, eating disorders, or substance abuse) and excluded on this basis.
With the exception of subclinical anxiety or depression, if participant answers yes to any questions below, review the screen with Dr. Fergus

If excluded: Individuals who are excluded for mental health reasons will be referred to a mental health professional in their community for treatment.

Have you ever taken any medication for problems with mood or anxiety?
YES/NO _____

Have you ever been diagnosed by a professional as having a mental health or emotional disorder, or received treatment for a mental health concern?
YES/NO

If yes:
a) When? _____
b) What was it? _____
c) Were you treated for it? YES/NO
If Yes:
What type of treatment? (e.g. counselling, medication, hospitalization)
_____

With whom? (e.g. psychiatrist, psychologist, pastor, etc.)
_____

For how long*?* _____
_____

Currently still in Treatment? Y/N
If no, when was the last time you received this treatment and/or saw your health care professional regarding this treatment?

_____

Supplementary Mental Health Questions
If condition not clear from Mental Health Screen, continue with the following questions (i.e. only proceed with 1 through 4 if you think they may be suffering from something but not able to articulate clearly)
– Query re: whether condition stable – and whether under the care of a mental health professional.

1. Have you been consistently depressed or down, most of the day, nearly every day, for the past two weeks? YES/NO
If yes: Please describe
_____

2. Have you ever had a period of time when you were feeling 'up' or 'high' or 'hyper' or so full of energy that you got into trouble or that other people thought you were not your usual self? *Manic-Depression:* YES/NO
If yes: Please describe _____

3. Do you experience disabling anxiety or panic attacks? YES/NO
If yes: "are there places, events or people that you avoid because of your anxiety/panic attacks [e.g. crowds, subway, etc) (assess whether avoidant of crowds i.e., orientation meeting).
_____
_____
_____

4. In the past month have you been bothered by recurrent thoughts, impulses, or images that were unwanted, distasteful, inappropriate, intrusive, or distressing? YES/NO
If yes: Please describe _____
_____

Suicide screen:
Have you ever felt like life was so bad that it wasn't worth living? YES/NO

If yes: Do you ever have thoughts of hurting yourself? YES/NO

If yes: Have you ever attempted to harm yourself? YES/NO
If yes:
Please describe: _____
_____
_____
When was the last time this happened?_____

Has is occurred more than once? YES/NO If yes, how often?

_____

_____

Have you sought out treatment? YES/NO If yes, please describe kind of treatment:

_____

Do you see yourself at risk of trying this again in the near future? Y/N
If yes,
If no, how come? (Probe for reasons would not attempt, e.g. family, religion)
_____

_____

_____

If no, moving forward do you feel you have a plan in place to ensure your safety over the course of the program should you find yourself in an overwhelming situation? YES/NO
Please describe: _____

Eating disorder screen:

A. Anorexia Nervosa

Have you ever had a time when you weighed much less than other people thought you ought to weigh? YES/NO
If yes,
Why was that? How much did you weigh? How old were you then? How tall were you? :
_____

At that time, were you very afraid that you could become fat? YES/NO

At that time, did you ever miss 3 consecutive menstrual cycles? YES/NO

At your lowest weight, did you still feel too fat or that part of your body was too fat? YES/NO
If no,
Did you need to be very thin in order to feel good about yourself?
_____

If no and low weight is medically serious,
When you were that thin, did anybody tell you it could be dangerous to your health to be that thin? (What did you think?)
_____

_____

B. Bulimia Nervosa

Have you often had times when your eating was out of control? Tell me about those times.
_____

_____

If unclear,

During these times, do you often eat within any 2-hour period what most people would regard as an unusual amount of food? Tell me about that _____

_____

Did you do anything to counteract the effects of eating that much? (Like making yourself vomit, taking laxatives, enemas or water pills, strict dieting or fasting, or exercising a lot?)

_____

Did your body weight or shape greatly influence how you felt about yourself? YES/NO

How often were you eating that much (AND COMPENSATORY BEHAVIOR)?
(At least twice a week for at least 3 months?)

_____

Substance abuse screen:

Have you ever had problems with excessive drinking, smoking, or prescription/illicit drug use or were told by family/friends that you need to cut down your alcohol/drinking or drug use? YES/NO

If yes, continue:

Have you ever missed work or school because you were intoxicated, high, or very hung over?
(What about doing a bad job at work or failing courses at school because of your drinking?)
IF NO: What about not keeping your house clean [IF CHILDREN: or not taking proper care of your children because of your drinking?
IF YES TO EITHER: How often? (Over what period of time?)

Have you ever drank in a situation in which it might have been dangerous to drink at all? ([Did you ever drive/Have you ever driven] while you were really too drunk to drive?)
IF YES AND UNKNOWN: How many times? (When?)

Has your drinking gotten you into trouble with the law?
IF YES AND UNKNOWN: How often? (Over what period of time?)

Did your drinking cause/Has your drinking caused) problems with other people, such as with family members, friends, or people at work? ([Did you get/Have you ever gotten] into physical fights when you were drinking? What about having bad arguments about what happens when you drink too much?)
IF YES: Did you keep on drinking anyway? (Over what period of time)?

IF DEFINITE PERIOD: Now I'd like to ask you a few more questions about (TIME WHEN DRINKING THE MOST OR HAD PROBLEMS). During that time…
IF NO DEFINITE PERIOD, CHECK FOR LIFETIME USE WITH PHRASES IN ITALICS. Now I'd like to ask you some more questions about your drinking.
Have you often found that when you started drinking you ended up drinking much more than you were planning to? (Tell me about that.)
IF NO: What about drinking for a much longer period of time than you were planning to?

Have you tried to cut down or stop drinking alcohol?

IF YES: Did you ever actually stop drinking altogether? (How many times did you try to cut down or stop altogether?)
IF NO: Did you want to stop or cut down? (Is this something you kept worrying about?)

Have you spent a lot of time drinking, being high, or hung over? (How much time?)

Have you had times when you would drink so often that you started to drink instead of working or spending time at hobbies or with your family or friends, or engaging in other important activities, such as sports, gardening, or playing music?

When did (symptoms endorsed ABOVE) occur? (Did they all happen around the same time?)

Exclusion criteria: Three or more items above occurred within the same 12-month period

Physical activity readiness screen:
Has your doctor ever said that you have a heart condition OR high blood pressure? YES/NO

Do you feel pain in your chest at rest, during your daily activities of living, OR when you do physical activity? YES/NO

Do you lose balance because of dizziness OR have you lost consciousness in the last 12 months? (Please answer NO if your dizziness was associated with over-breathing (including during vigorous exercise). YES/NO

Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)? YES/NO

Are you currently taking prescribed medications for a chronic medical condition? YES/NO

Do you have a bone or joint problem that could be made worse by becoming more physically active? Please answer NO if you had a joint problem in the past, but it does not limit your current ability to be physically active. For example, knee, ankle, shoulder or other. YES/NO

Has your doctor ever said that you should only do medically supervised physical activity? YES/NO

Eligibility criteria: Participant answered "NO" to all of the above questions, and is cleared for physical activity
---

If yes to one or more of the questions above, continue with follow-up questions:

Do you have Arthritis, Osteoporosis, or Back Problems? YES/NO

If yes,
Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer NO if you are not currently taking medications or other treatments) YES/NO
Do you have joint problems causing pain, a recent fracture or fracture caused by osteoporosis or cancer, displaced vertebra (e.g., spondylolisthesis), and/or spondylolysis/pars defect (a crack in the bony ring on the back of the spinal column)? YES/NO
Have you had steroid injections or taken steroid tablets regularly for more than 3 months? YES/NO

Do you have Heart Disease or Cardiovascular Disease? *This includes Coronary Artery Disease, High Blood Pressure, Heart Failure, Diagnosed Abnormality of Heart Rhythm* YES/NO

If yes,
Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer NO if you are not currently taking medications or other treatments) YES/NO
Do you have an irregular heart beat that requires medical management? (e.g., atrial fibrillation, premature ventricular contraction) YES/NO
Do you have chronic heart failure? YES/NO
Do you have a resting blood pressure equal to or greater than 160/90 mmHg with or without medication? (Answer YES if you do not know your resting blood pressure) YES/NO
Do you have diagnosed coronary artery (cardiovascular) disease and have not participated in regular physical activity in the last 2 months? YES/NO

Do you have any Metabolic Conditions? *This includes Type 1 Diabetes, Type 2 Diabetes, Pre-Diabetes* YES/NO

If yes,

Is your blood sugar often above 13.0 mmol/L? (Answer YES if you are not sure) YES/NO
Do you have any signs or symptoms of diabetes complications such as heart or vascular disease and/or complications affecting your eyes, kidneys, and the sensation in your toes and feet? YES/NO
Do you have other metabolic conditions (such as thyroid disorders, pregnancy-related diabetes, chronic kidney disease, liver problems)? YES/NO

Do you have any other major medical issues/conditions? YES/NO
If yes, please describe: _____

Have you ever been seriously injured? YES/NO
If yes please describe: _____

Eligibility criteria: Participant answered "NO" to all of the follow-up questions and is ready to become physically active; if answered "YES" to one or more follow-up questions, she should seek further information before becoming more physically active or engaging in this study—consult with a qualified exercise professional (CSEP-CEP) to work through the ePARmed-X+ and for further information.

Conclusion

Is there anything else that I haven't asked you that you feel is important for me to know?

_____
_____

For Screener's Purposes Only
Details to Note about the Individual:

_____
_____

If Eligibility Criteria Met:
What to say: "Thank you for answering all my questions. It sounds like the program will be appropriate for you. Do you have any other questions you want to ask me?"

"Next I will run everything by [the Principle Investigators]. If given the go ahead to proceed, they will contact you about when to come in to Sunnybrook to sign an informed consent form and complete your baseline measures.

Once you have completed these measures, you will be granted access to the program website and will begin the interview shortly thereafter."

If Eligibility Criteria Not Met

What to say: "Unfortunately, at this time, we are currently in the process of trying this program out with a very specific group of people in order to test its effectiveness. You do not meet this specific criteria, and we regret to inform you that are you not eligible to participate, but we greatly appreciate your interest in the study and I am grateful for the opportunity to have spoken with you."

Appendix C: Intake Interview

Hi _____. Thank you for taking the time to speak with me today. The purpose of this call is to 1) formally introduce myself to you, 2) to gain some personal information about your diet, exercise and weight history so that we have a sense of your history as you enter the group, and 3) to provide you with some information about what to expect once this group begins and how to get you set up online. This process is entirely voluntary and you do not have to respond to any question if you do not wish to. In total, this interview should take approximately one hour, and with your permission, I would like to audio-record it. How does this all sound to you? [If participant agrees, start recording.]

Okay, so I am going to start recording now. Do you have any questions for me before we begin?

1) So to start, my name is (Facilitator's name). [Facilitator introduction and background].

Before I switch gears and ask you some questions about yourself, is there anything you would like to ask me about myself, or the program?

2) Alright, so now I would like to ask you about your previous patterns of eating, exercising and feeling about your body, so that Dr. Fergus and I will be in a better position to help you make use of the group to address your specific concerns and to help you develop realistic goals for yourself while participating in the group.

This lifestyle intervention is developed based on the assumption that how we behave and look on the outside is very much related to how we feel and think on the inside. For that reason, this program will involve group discussions surrounding not only diet and exercise, but also psychological and social issues faced by women in general and breast cancer survivors in particular that affect the choices we make and healthy living. In order for us to help you make the most of each group session that you will attend, it would be helpful for us to know about some of your background and personal experiences related to eating, exercise, weight and body image and social support. May I begin with some of these questions?

Great, so firstly, I am interested to know:

What attracted you, personally, to participate in this study?

How would you describe your current lifestyle (Gauge extent to which they lead a healthy lifestyle—e.g., types of things you do to stay healthy or try and improve your health? Exercise habits, dietary choices, extent of healthful choices)?

<u>Diet:</u>
*How would you describe your relationship to food?
What are your eating patterns (how many meals per day, typical daily intake)?
What are your favourite (both healthy and unhealthy) and least favourite foods?

<u>Exercise:</u>

What are your physical activity patterns (how often and what type of activity)?
What is your favourite and least favourite type of physical activity?

What would you say are your biggest challenges or barriers currently to maintaining a healthy weight or lifestyle in general?

As I mentioned, achieving a healthy weight or lifestyle extends beyond behaviour, and often involves deeper constructs, like body image, which can be especially important for women, and breast cancer survivors in particular. If you are comfortable, I would like to ask you about your feelings about your body and weight.

How do you feel about your weight? Did this change at all after having undergone breast cancer treatment? What was this like before your diagnosis?

How do you feel about your body? Did this change at all after having undergone breast cancer treatment? What was this like before your diagnosis?

Have you struggled with your weight or body prior to being diagnosed with breast cancer? Can you please elaborate upon these experiences in your life?

Can you recall any event in your past that you believe impacted your relationship to your body, body image or self-esteem? Eating/food? Physical activity? (For example, is there a time or specific formative relationship, where you recall being made to feel badly about how you looked? For example, ridiculed, judged, bullied?)

Thank you for sharing that information with me. I know it can be difficult to discuss these sensitive issues so I appreciate your openness. If you are okay to continue, I would now like to ask you about your available social support.

What type of social support do you have in your life?
Do you believe that your social supports play a role in your exercise, eating, or other lifestyle behaviours? If yes, how so?

Who is the person whom you rely most on for support?

Does he/she do things that interfere with or discourage you from behaving in healthy ways, or ways that would help you achieve your health goals?

Does he/she do things that encourage or support you to behave in healthy ways, or ways that would help you achieve your health goals?

We are just about done, but first I would like to finish by asking some questions about any previous attempts you have made in terms of living healthier, and what your hopes are going forward. This information will give us some direction as to what might be most and least helpful for you in the present program.

*In the past, if you have ever made attempts to lose weight, be more active, or live a healthier lifestyle more generally, what have been the most significant challenges?
*In the past, have you ever achieved a weight-loss or exercise goal, even if temporarily? If so, why do you think you were successful? Why do you think you were unable to sustain this progress?

What are you most hoping to get out of this program (i.e., what are your goals)?

What do you feel would be most helpful or motivating for you in achieving and maintaining these goals, long-term?

Is there anything else that you would like to share, that you think might help us better understand you and how to best support you in achieving your lifestyle goals throughout this program?

3) *Thank you for sharing that information about yourself. I hope that reflecting on these things is also helpful for you, and may even get you thinking about how you might make the most of this program. So finally, as I mentioned earlier, I would like to spend some time orienting you to the actual online group, including what you can expect, as well as what we hope to expect from you. There are a lot of administrative details, including information about the website we will be using. Do you have a pen and paper handy? I think you might find it helpful to jot some of this information down.*

Moodle@York:
The website that we are using for the program is called Moodle@York. This is a secure website that encrypts all shared and stored information to ensure that people outside of the group cannot hack the website or access any communication that takes place via the website. In order to use this secure service though, users need an authenticated York email account. Therefore, I will need to set you up with this account before you can join the group. To start, can you please provide me with your email? Great, so you should receive an email in the next day or so prompting you to activate your account and to log into Moodle. Note that there is usually a delay of a couple days between when you create your account and when you are able to log into Moodle. Once you can log in though, you will also be asked to update your profile, and when you do so, please only use your first name, or initials. This is so that we can ensure that your identity remains anonymous to the other group members. Once you have updated your profile, I will receive a notification that you have done so and then I can add you to the group. I know this is a lot of information—do you have any questions for me about this?

Excellent. So once you have successfully joined the group, I will email you about next steps, including how to access the discussion board and weekly materials. If you have any questions or issues navigating the site, we can also arrange to speak over the phone and I can walk you through it.

Active Participation:
Excellent. So I just want to say right off the bat that this program does involve a fair bit of work on your part. This is because it is designed to help you make lasting changes to your lifestyle well beyond the completion of this group. You will also be taught new ways of thinking about

your health and new skills that are designed to be integrated into your unique lifestyle and as such, help you maintain your personal and long-term health goals. Therefore, as is the case when learning any new skill, this program involves putting a lot of time and practice in at the beginning, with the hope that these new practices eventually become natural habits that you carry forward. In many ways, what you get out of this program depends on what you put in! How does this sound to you so far?

PowerPoint Slides:

So the first commitment on your end, and for all group members participating in this program, is that you will be expected to log into the Moodle website at least twice per week, but ideally more. This is because each week, there will be a new topic, or session, that Dr. Fergus and I will upload in the format of an approximately 15-minute PowerPoint slideshow with audio of our voices taking you through the material. You will have the option to pause and rewind the presentation for your convenience. Are you familiar with PowerPoint? (Gauge comfort using and explain format of weekly material with audio).

If you ever have an issue opening the file please send me an email and I will follow up to make sure you can access it.

So continuing on, each week, the new PowerPoint posted to the website will build upon the previous week, for a total of 12 sessions. These 12 sessions have been selected and developed with a lot of thought, based on existing scientific research. In particular, this program incorporates a range of psychological principles that we believe set it apart from other standard diet and exercise programs. For instance, we understand and appreciate that simply/merely telling a person what to do or eat is unlikely to be successful in the long run, because it robs the individual from their human need for autonomy or free choice. Therefore, an important aspect of this program is to tailor any and all changes you choose to make to your preferences, personal motivations, and what is feasible long-term for you. We will not be telling you what to do, rather offering a range of suggestions and teaching you principles and strategies that have been scientifically demonstrated to be helpful. Because the program builds gradually, it is very important that you carefully review and understand the material for each session. If you are ever unsure about a concept or want further clarification, Dr. Fergus and I are always available to answer questions via the discussion board. In fact, we recommend using the discussion board as a first option, and as often as you please, because it allows you and the other women to learn with and support one another in your progress. And we also know that social support is a big predictor of outcomes. I will speak more about the discussion board momentarily, but for now, do you have any questions about the weekly slides, which are really the meat of this intervention?

Discussion Board:

So as I mentioned, you will also be expected to use the Moodle discussion board to participate in group discussion each week with the other women in the intervention. Dr. Fergus and I will post regularly on this board to stimulate conversations about relevant topics and to check in about your thoughts and reactions to the material. You are encouraged to use this board as often as you would like, but at the very least, we ask that you use it to respond to specific questions that

we will pose to the group members each week. Do you have any questions about this part of the program?

Homework:

The final aspect of your weekly involvement in this program will be to complete weekly "homework" exercises on your own time. This homework will consist of a specific exercise that is relevant to the PowerPoint lesson that we will have posted that week, and/or keeping a diary of the foods that you will have eaten each day that week. We will be providing you with electronic versions of the various worksheets and diaries that you will need to complete these exercises each week. After completing either or both of these activities, you will submit them back to Dr. Fergus and I, online so that we can review them. The purpose of these homework exercises are to help you put into practice the concepts you will be learning about, and to allow for the opportunity for professional support and direction. I cannot stress enough the importance of these exercises, and particularly the diaries; there is a great deal of research suggesting that when people keep track and monitor their behaviours, they become more aware of their patterns (including those that are more and less helpful), and as a result, are more likely to be successful at making meaningful changes that allow them to reach their broader goals. What are your thoughts on the homework component of the program?

Limits of Confidentiality:

Before wrapping up, there is one last administrative piece I need to go over with you…I do just want to make clear a couple things about the information shared via this discussion board. Firstly, while it is unlikely, I do need to mention that if something particularly distressing or a personal crisis were to occur for you during the course of the program, that you please contact me directly—rather than sharing that information with the group members, for example by posting about it in the discussion board. While we do encourage group members to support one another generally throughout this program, we want to ensure that in the rare event of a crisis, you receive the best response, which we as professionals, can guarantee. Also, we would want to make sure that the other group members not be unnecessarily upset by someone's situation. How does that sound to you?

Also, in order to preserve your anonymity and that of the other women, it is important not to disclose any personally identifying information, or in the case that someone else does, to not share this with anyone outside of the group. Similarly, Dr. Fergus and I have an obligation to keep all of your personal information confidential. Part of this information includes brief notes that we are legally required to keep on each of the group members' progress. This is because while this intervention is being offered in the format of a scientific study, it is also a therapeutic service. So, just as would be the case if you were to meet with a psychologist for individual therapy, we need to maintain a record of this service. Does this make sense to you? Okay, so as I mentioned, this information is kept confidential, but there are a few rare extreme situations that would require us, by law, to break this confidentiality. These situations include 1) if we were to learn that you are at risk of harming yourself or others, 2) if we learned that a child was being abused or even at risk of being abused, 3) if we found out that another health care professional, such as a doctor or dentist, had been engaging in professional misconduct with a patient, and finally 4) if you were in a legal proceeding and the court issued a subpoena of our notes. Do you have any questions about this?

Summary and Installation of Hope:

Great. These are the things that if you commit to doing each week, we believe will really make the difference of how much you benefit from this group. How does all of this sound to you? Are these things that you feel prepared to be able to commit to over the next 12 weeks?

[Co-facilitator's name] and I really want to see you succeed in this program and are here to help in any way we can. The nice thing about the online format of this group is that you don't have to make it to a weekly meeting, and therefore, you should be able to review the material at your convenience. Therefore, it really is expected that you do not 'miss a week.'

Appendix D: Demographics Questionnaire

1) Age: _____

2) Do you have children?
☐ Yes
☐ No

If yes, please list gender and age of each:

Gender	Age
_____	_____
_____	_____
_____	_____
_____	_____

3) In what country were you born? _____

4) What is your first language? _____

5) Ethnic Background:
☐ Non-Hispanic White or Euro-American
☐ Black, Afro-Caribbean, or African American
Latino or Hispanic American
☐ East Asian or Asian American
☐ South Asian or Indian American
☐ Middle Eastern or Arab American
☐ Canadian Aboriginal or Native American
☐ Other – please specify: _____

6) Marital Status:
☐ Single
☐ Married
Common Law
☐ Other – please specify: _____

If in an intimate relationship, length of relationship: _____Years

If married, length of marriage: _____Years

7) How did you find out about this program?

_____

8) Why did you agree to participate in this project?

_____

9) What is your current living situation?
☐ I live alone
I live with a roommate(s)
I live only with my partner
I live with my partner and child/children
I live with my partner and non-family members
☐ Other – please specify: _____

10) Highest level of education completed:
☐ No formal schooling
Primary school
High-school
College program
University degree
☐ Other – please specify: _____

11) What is your annual income status?

☐ $0 – $9999
$10,000 – $25,000
$25,000 – $50,000
$50,000 – $75,000
$75,000 – $100,000
$100,000 – Up

12) What is your usual occupation? _____

Currently working
Retired

13) What is your favourite hobby, pastime, or activity?
_____

Medical Information:

Month and year of breast cancer diagnosis: _____

Stage and type of breast cancer:
☐ Stage 1
☐ Stage 2
☐ Stage 3

Age (in years) at time of breast cancer diagnosis: _____

How long ago (in months) did you complete active treatment? _____

What is your menopausal status?
☐ Premenopausal
☐ Postmenopausal

Treatment history
a) Surgery?
☐ Yes
☐ No

If "yes", then check all that apply below:
☐ None
☐ Single mastectomy
☐ Single lumpectomy alone
☐ Bilateral mastectomy
☐ Lumpectomy followed by mastectomy
☐ More than one lumpectomy
☐ Reconstruction following mastectomy
☐ Other – please specify: _____

b) Chemotherapy?
☐ Yes
☐ No

c) Radiation Therapy?
☐ Yes
☐ No

d) Hormonal Therapy?
☐ Yes
☐ No

e) Herceptin Treatment?
☐ Yes
☐ No

f) Other treatment: _____

7. Have you ever had any other major medical concerns/conditions? (Please list).

_____
_____

Appendix E: Program Expectancy Questionnaire

We would like you to indicate below how much you believe, *right now*, that this program will help you live a healthier lifestyle and improve your quality of life.

_____

By the end of the program, how much improvement in your physical and mental health do you really *feel* will occur?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
No Improvement Complete Improvement

Appendix F: Treatment Satisfaction Questionnaire

We are asking for your assistance in providing feedback about the online *Healthy Lifestyle Modification after Breast Cancer* program you recently participated in. Your responses will be kept strictly confidential, and your name will not be associated with any of your comments.

Program Evaluation:

Overall, how satisfied were you with the *Healthy Lifestyle Modification after Breast Cancer* program?

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

Please elaborate:

_____
_____
_____
_____
_____

Overall, I found the program to be convenient:

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

Please elaborate:

_____
_____
_____
_____

What did you like best about the program?

_____
_____
_____
_____

What did you like least about the program?

_____
_____
_____
_____

What was the most valuable thing you learned?

_____
_____
_____
_____

Are there any ways that we could improve this program? Please be specific about what you would like to see changed:

_____
_____
_____
_____

The weekly videos were important to my progress throughout the *Healthy Lifestyle Modification after Breast Cancer* program.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

Please elaborate:

_____
_____
_____

The weekly discussion board was important to my progress throughout the *Healthy Lifestyle Modification after Breast Cancer* program.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

Please elaborate:

_____
_____
_____

The weekly diaries and/or homework exercises were important to my progress throughout the *Healthy Lifestyle Modification after Breast Cancer* program.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

Please elaborate:

_____
_____
_____

Were there any components (e.g., videos, discussion board, weekly exercises) that you did not find informative or helpful? If so, please specify:

_____
_____
_____
_____

Did you read the homework feedback that your facilitators provided back to you?

□ Yes □ No

The homework feedback I received from the facilitators was important to my progress throughout the *Healthy Lifestyle Modification after Breast Cancer* program.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

Please elaborate:

_____
_____
_____

The total amount of interaction (i.e., online and phone) with the facilitators was sufficient.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

Please elaborate:

_____
_____
_____

The role of the facilitators is a necessary component of this program.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

Comments:

_____

_____

_____

Website:

I think that I would like to use this website frequently.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I found the website unnecessarily complex.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I thought the website was easy to use.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I think that I would need the support of a technical person to be able to use this website.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I found the various functions of the website were well integrated.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I thought there was too much inconsistency in this website.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I would imagine that most people would learn to use this website very quickly.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I found the website very cumbersome to use.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I felt very confident using the website.

Strongly Disagree				Strongly Agree
1	2	3	4	5

I needed to learn a lot of things before I could get going with this website.

Strongly Disagree				Strongly Agree
1	2	3	4	5

The website was easy to use and navigate:

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

The website could be improved by:

_____
_____
_____
_____

Would you recommend the *Healthy Lifestyle Modification after Breast Cancer* program to other breast cancer survivors who are looking to lose weight or make healthy changes to their lifestyle?

□ Yes □ No

Please elaborate:

_____
_____
_____

General:

Have you ever participated in any other weight loss/healthy lifestyle programs?
Yes _____ No _____

If yes, how did this program compare to the one(s) in which you previously participated?

_____
_____
_____
_____

Any additional comments?

_____
_____
_____
_____

Thank you very much for your feedback, and for completing these questionnaires! ☺

Appendix G: Post-Treatment Semi-Structured Interview

Introductory Remarks: [do not have to be read verbatim]

"Thank you for taking the time to speak with me today. This interview should take approximately 1 hour and, if you're okay with it, I would like to audio-record it. As Dana may have explained to you, we are conducting these interviews because this program is so new and we really hope to learn from participants, including yourself, about how you found the group so that we can improve upon this service for future breast cancer survivors. Your feedback is especially important and timely, as we are currently running a second group and are very committed to taking the valuable information we receive from you today and using it to enhance the experience of those women participating in the group that is ongoing now, as well as any future groups we run. This interview will be used for this purpose only and will be confidential.

*Are you comfortable with me audio-recording this interview? [*If yes] *Great. If at any point you would like us to pause, or for me to pause the recorder – please let me know.*

Start official recording: State "*Today is [***date and time**], *this is [***interviewer's name***] and I am speaking with [***participants' first name***]."*

Remember:

- Have participant elaborate on their words (e.g. Participant: "I found exercise 1 most enjoyable"; Interviewer may ask: "What about it was enjoyable")
- The questions overlap and participants may have already answered the question in a previous response, so it may not be necessary to ask every question.

So my first question…

Please share with me your experience of the *Healthy Lifestyle Modification after Breast Cancer* program overall

- **What was it like to take part in this program?

- **In what ways was the program helpful to you? How so?

- What did you like most about the program? What did you like least?

- **If you recall, the program covered a range of topics, including… (refer to list). Which session or topic did you like most? Please elaborate.
    - Which session or topic did you like the least? Please elaborate.

- What did you think about the length of the program? Did you find 10 topics to be too much, not enough, or just the right amount?

- **Was there anything you felt was missing from the program or that you would have hoped to focus on more?

- **How did you find the homework assignments? (Regardless of whether they *liked* doing them or not) Were these a useful part of the program?
    - What about the amount of homework? Did you find it to be too much, not enough, or just the right amount?

- How did you find using the diaries to track your behaviours (food and activity)? Were these a useful part of the program?

- **What were your expectations going into the program? (probe re: whether these were met).
    - Did the program fall short of your expectations in any way?

- **What was your experience of having this program offered as part of a group with other women, as opposed to doing this one-on-one with a facilitator online? Did you find the social aspect to be a helpful feature of the program? Did you feel supported by or connected with your fellow group members?

- **What, if any, were the challenges to your participation?

Please share with me your experience of the online format of the program

- **What was it like to take part in an ***online*** (versus in-person) program?

- **Did you find the Moodle website user-friendly? What did you like/dislike about it?

- How did you find the weekly videos? Was this a useful way of delivering the information online?

- **How did you find using the discussion board? Do you think this was a valuable aspect of the program?

- **Do you have any suggestions about how to improve the online delivery of this program?

Please share with me your experience with your group facilitators

- **How did you find the involvement of your group facilitators, Dana and Dr. Karen Fergus?

- What other support from the facilitators do you think would be beneficial in the future?

I would now like to ask you some questions to learn about whether or how your behaviours and views might have changed since participating in this program.

- **Do you feel that you are living a healthier lifestyle now, after having participated in the healthy lifestyle group? Please explain.
    - If so, what occurred throughout your participation that has led to this progress?
    - If not, why do you feel that your participation did not lead to any significant changes?

- **Since participating in this program, how, if at all, have your eating habits changed?

- **Since participating in this program, how, if at all, have your physical activity habits changed?

    - **How confident are you that you can maintain the changes that you have made? How do you plan on doing so?

- **What would you say the biggest challengers or barriers might be for you going forward in maintaining a healthy weight or lifestyle in general?

- Regardless of whether or not you have lost weight, how do you currently feel about your weight/body? Has this changed at all after having participated in the lifestyle group?

Please share with me any other thoughts

- Is there anything else you would like to share with us about your experience in this program? Or in relation to future directions for the program?

Thank them once again for their participation and valuable feedback.
Remind them about contacting dietician at Sunnybrook if they have not done so already to schedule their second set of measures.