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The Feasibility of an Online Maintenance Exercise Program for Cancer Survivors Supported by Health Coaching

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The Feasibility of an Online Maintenance Exercise Program for Cancer Survivors Supported by
Health Coaching

by

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A THESIS

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Abstract

Purpose: The primary objective of this study was to investigate the feasibility of an online synchronous group-based exercise maintenance program supported with health coaching (HC) for cancer survivors. A secondary objective was to provide preliminary evidence of the impact of a HC-supported exercise maintenance program on PA levels, psychosocial well-being, symptom management, and coping with COVID-19 isolation.

Methods: Participants were recruited to this study after completing the Alberta Cancer Exercise 12-week exercise program. All participants received a synchronous delivered group-based online exercise maintenance program via Zoom. Participants were randomized to receive the maintenance program only, or to receive the program plus weekly HC calls. Two waves of this program with different lengths (8-week and 12-week) occurred. Pre- and post-assessments included fitness and patient-reported outcomes, a continuous measure of objective physical activity (Garmin Viviosmart4), and semi-structured interviews.

Results: Forty participants ($n_{8WK}=25$; $n_{12WK}=15$) enrolled in the study, $n=39$ completed. The study was feasible, as measured by recruitment rate (42.6%), attrition rate (2.5%), safety (no adverse events), assessment completion (questionnaires: 98.8%; physical functioning assessment: 97.5%; activity tracker: 83.4%), attendance to the exercise classes (91.2%), attendance to the HC calls (97.0%), and fidelity of the intervention protocols (exercise class: 92.6%; HC: 96.7%). Based on the qualitative feedback, a key facilitator to the online programming was the convenience, whereas a limitation was the ability to connect with other cancer survivors. The mean call length of the HC calls was 34.2 ± 13.2 minutes and facilitators for HC were having a connection with the coach, receiving tailored educational topics, and having an active listener that keeps one accountable.

Conclusion: Overall, the synchronous online delivery of exercise classes, the additional HC support, and the tools used to measure the effect of these interventions were feasible and safe for cancer survivors. The findings of this work may inform a future fully powered trial testing the efficacy of such programming in supporting cancer survivors to maintain an active lifestyle.

Keywords

health coaching, exercise, physical activity, maintenance, cancer survivors, online-delivery, mHealth

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Dedication

I would like to dedicate this thesis to the incredible ACE participants that always amaze me with their resilience and kind heartedness. You're the reason I became passionate about this work in the first place!

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List of Symbols, Abbreviations and Nomenclature

Abbreviation	Definition
HC	Health Coaching
PA	PA
MVPA	Moderate to Vigorous Physical Activity
QoL	Quality of Life
HRQoL	Health Related Quality of Life
CRF	Cancer related fatigue
mGLTEQ	modified Godin Leisure Time Exercise Questionnaire
PRO	Patient Reported Outcomes

Chapter One: **Introduction**

1.1 Cancer, cancer treatment and side effects

Cancer is the number one cause of death in Canada, and yearly about 220,000 people are diagnosed with cancer. Prevalence rates indicate that one in two Canadians will be diagnosed within their lifetime (Canadian Cancer Statistics Advisory Committee, 2019). With improving technologies in early cancer detection and advancements in cancer treatment, survival rates have increased significantly (Hashim et al., 2016). The result is that cancer survivors, defined as people “living with and beyond cancer” (Macmillan Cancer Support, 2011), are growing rapidly in numbers. However, survival comes at a cost, as cancer treatments often result in a multitude of negative symptoms and side-effects that diminish quality of life (QoL). The etiology for reduced QoL is multifactorial and may include anxiety, cancer related fatigue (CRF), depression, decreased physical functioning, cardiotoxicity, or the experience of other treatment-related side effects. As an example, CRF is one of the major contributors to decreased QoL, impacting 80-90% of adult cancer patients and their ability to return to work and their independence in daily life (Hofman et al., 2007).

1.2 Cancer and Exercise

Exercise is one of the most effective non-pharmaceutical interventions to manage symptom burden from cancer treatments (Joly et al., 2019). In several independent studies, a combination of aerobic and resistance training was found to significantly reduce anxiety in cancer survivors (Mishra et al., 2012; Persoon et al., 2013; Zhou et al., 2016). This combination was also found to significantly decrease depressive symptoms (Brown et al., 2012; Craft et al., 2012), as well as increase health related QoL (HRQoL; Sweegers et al., 2018) and physical functioning (Swartz et

al., 2017). A systematic review, including 170 studies, found that any type of physical activity (PA) intervention significantly decreases the severity of CRF (Oberoi et al., 2018).

In addition to the improvements in QoL, CRF, and emotional indices of anxiety and depression, there is compelling evidence that participating in regular exercise has a protective effect against cancer-specific mortality (28–44% reduced risk), cancer recurrence (21-35% reduced risk), and all-cause-mortality (25-48% reduced risk; Cormie, Zopf, Zhang, & Schmitz, 2017). However, since these findings are mainly observational from epidemiologic studies, they cannot identify causality.

Despite these known benefits associated with exercise, levels of PA in cancer survivors remain low (Garcia & Thomson, 2014). Most cancer survivors don't meet the exercise guidelines of 90 min/week of moderate to vigorous PA (MVPA; Ottenbacher et al., 2012). Grimmer et al. (2019) found in their systematic review a median baseline MVPA levels of 86min/week in cancer survivors. Therefore, more than half of the 5792 cancer survivors included in the meta-analysis did not meet the cancer specific exercise guidelines. The reasons for not meeting PA guidelines often consists of multiple barriers, including lack of time, proximity and accessibility to cancer specific exercise centers, as well as the impact of treatment-related barriers such as CRF (Jackson et al., 2018).

Based on this compelling evidence, the current exercise guidelines for cancer survivors recommend moderate intensity aerobic training for at least 30 minutes at least three times per week over a time period of 8 to 12 weeks, and resistance training with an intensity of at least 60% of one repetition maximum and at least two sets of 8-15 repetitions at least two times per week (Campbell et al., 2019). These exercise programming recommendations should be tailored and adjusted based on the individual's health status, fitness status, preferences for activity, and

medical history. To ensure safety, exercise guidelines highlight that exercise prescription should also take into account bone loss, bone metastases, lymphedema, age, ostomy, peripheral neuropathy, stem cell transplantation, and sun exposure (Campbell et al., 2019).

1.3 Home-based program

The benefits of exercise appear to be quite consistent regardless of exercise type, and with some dose-response implications. Specifically, a minimum amount of PA intensity and duration is necessary to receive some physical health/physical function benefits from exercising, but beyond that it remains unclear if there are any variations due to exercise dosage (Campbell et al., 2019; Cormie et al., 2017). However, in other areas relevant to the impacts from exercise programs, such as characteristics of the program setting, there are mixed findings. For example, both supervised and unsupervised exercise are related to significantly improved anxiety, depression, CRF, HRQoL, and physical functioning. However, for all symptoms except CRF, a supervised program showed greater improvements compared to an unsupervised program (Campbell et al., 2019).

The differences in outcomes for participants in supervised vs unsupervised programs may be due to variations in adherence rates. Specifically, unsupervised programs, which are often conducted in a participant's home generally have a lower adherence rate compared to programs conducted in a centre, where typically some supervision is provided (Courneya et al., 2012; Husebø et al., 2013; Pinto et al., 2009). Despite potential lower adherence for home-based participants, other factors such as convenience and cost may make home settings a favourable choice for cancer survivors. Specifically, home-based programs allow for flexibility in scheduling, which may be especially important for younger cancer survivors who have family or work-related responsibilities. Home setting also reduces barriers such as travel time to a fitness

facility, which can be exacerbated by local weather/traffic conditions (Granger et al., 2018; Nock et al., 2015; Wilson et al., 2006).

The majority of cancer survivors prefer to exercise alone at home (Jackson et al., 2018; Nock et al., 2015), suggesting that home-based exercise programs may optimize exercise adherence if they are preference-based (Nock et al., 2015). In a recent study, Stone et al. (2019) found that regardless of the volume of an exercise program, the unsupervised program achieved higher adherence rates compared to the supervised sessions, which is in contrast with earlier findings of lower exercise adherence in unsupervised settings (Courneya et al., 2012; Husebø et al., 2013; Pinto et al., 2009). Stone et al. (2019) argue that higher adherence rates in the unsupervised group were mainly due to the increased scheduling flexibility. It is important to note, that most of the existing literature regarding home-based exercise oncology is in an unsupervised setting.

To the best of our knowledge, there has been no study to date with cancer survivors examining the provision of synchronous online delivered exercise programming with virtual supervision by a qualified exercise professional. Bland et al. (2020) highlight this as a gap in the exercise oncology research. Home-based settings may be advantageous, reducing the risk of exposure for individuals undergoing immunocompromising treatments (Bland et al., 2020). In addition, synchronous delivered group-based exercise classes come with the previously mentioned reduced barriers to exercise while at the same time ensuring high quality of exercises, due to being supervised by a qualified exercise physiologist, and having the ability to connect with other cancer survivors. Previous studies in other populations have shown promising results in terms of feasibility and preliminary effectiveness of such interventions (Holland et al., 2013; Tomlinson et al., 2020); however neither of these studies examined exercise in a group-based

setting. Tomlinson et al. (2020) found that the synchronous delivery over Skype was feasible and reported an attendance rate of 67.0% and a completion rate of 77.8%. Holland et al. (2013) had similar findings with an attendance of 76.0% and deemed the intervention both safe and feasible.

1.4 Adherence and Maintenance

Given the potential preference for home-based programs and the scheduling flexibility that such programming may provide, there is a need to determine how to support exercise adherence and PA maintenance in the home setting for cancer survivors. Adherence is commonly defined as “[...] the degree to which a person completes a given exercise prescription [...]” (Pinto et al., 2009). Adherence measures can vary from percentages of class attendance, a percentage classification (into high adherence or low adherence) (Stone et al., 2019), the average minutes per week exercised compared to either baseline levels (change score), meeting or not meeting exercise guidelines (i.e., 90min/wk recommended for cancer survivors), or self-determined activity goals/exercise levels (Kampshoff et al., 2014).

The most important determinant for exercise adherence in cancer survivors, regardless of exercise setting or supervision, in cancer survivors is intention (Husebø et al., 2013). A second key predictor of exercise adherence is self-efficacy (Pinto et al., 2009). Self-efficacy is one’s belief in one’s ability to accomplish a task (Bandura, 1977). Numerous other individual, demographic, behavioural, cognitive and social factors may also be significant predictors of exercise adherence in an unsupervised setting (Courneya et al., 2012). For example, a recent systematic review identified social support, guidance, and the amount of exercises provided as the top three predictors of adherence to home-based exercise programs. Guidance was defined as the ability of a coach or physiotherapist to educate, motivate, and support a participant. Other findings suggest that higher volumes of exercise may be detrimental to exercise adherence (Bachmann et al., 2018; Stone et al., 2019). Despite establishing key facilitators, adherence rates

seen in the literature for cancer survivors vary widely, from 67.5% (Husebø et al., 2013) to reported adherence of 84% (Wilson et al., 2005).

In addition to understanding exercise intervention adherence, a further consideration is a focus within interventions on supporting behaviour change, thus providing a solid foundation for exercise maintenance. “Maintenance is defined as a continued behavior shown during a given period and after an intervention complying with a threshold believed to improve well-being or health” (Seymour et al., 2010). According to the transtheoretical model (TTM; Marcus et al., 1996) the maintenance phase begins after 6 months of continuous exercise. However, Grimmett et al. (2019) found that measuring long term behaviour change (i.e., exercise maintenance) after a minimum of 3-months of follow-up had similar results compared to studies recording a minimum of 6-months follow-up period. This work also identified key predictors for maintenance of exercise in cancer survivors. The first predictor was graded tasks, which is the setting of realistic goals and the gradual increase in difficulty level. The second predictor was social support, which incorporated praise and reward of achievements as well as motivational coaching. Action planning was the third significant predictor of successful maintenance of exercise and included a precise planning of the desired behaviour. All three of these behaviour change techniques were more effective in young and previously active cancer survivors (Grimmett et al., 2019).

In 2019, Lund et al. compared a supervised to a home-based long-term progressive resistance training program on PA maintenance. The initial findings revealed higher adherence in the supervised program compared to the home-based program. However, after 5 months of exercise, the percentage of cancer survivors in the home-based program being active was

maintained, whereas the percentage of cancer survivors in the supervised program being active was lower (Lund et al., 2019).

A common limitation of exercise studies is that most samples mainly include already motivated individuals. By the nature of exercise studies only individuals in at least the contemplation stage of behaviour change would volunteer to sign up for a study. Failing to include individuals in a pre-contemplation stage may lead to a sampling bias and would mean the samples included in such studies would not be an accurate representation of the population. This would mean that the adherence and maintenance rates stated in the previously mentioned studies may be overpredicting the adherence to PA guidelines in the general cancer survivor population.

1.5 Health Coaching

A potential facilitator of home-based exercise adherence is health coaching (HC), which provides support via a positive motivational climate, development of behaviour change skills, and feedback on exercise progression. HC is defined as “a patient-centered approach wherein patients at least partially determine their goals, use self-discovery or active learning processes together with content education to work toward their goals, and self-monitor behaviors to increase accountability, all within the context of an interpersonal relationship with a coach.” (Wolever et al., 2013). There seems to be no general consensus on the protocol of providing HC to cancer survivors (Barakat et al., 2018; Wolever et al., 2013). However, a recent research proposal suggested a tapered approach with one long session (60min) in the first week and shorter sessions (30min) with increasing intervals in the following weeks (Hardcastle et al., 2019). In patients with chronic disease, HC has been primarily provided via three means of communication: internet based, telephone, or face-to-face (Kivelä et al., 2014).

A systematic review on HC in cancer survivors found that telephone or face-to-face methods achieved increases in cancer survivors' QoL and mental health, however, no change in

self-efficacy was reported (Barakat et al., 2018), perhaps surprising given HC targets self-efficacy (Frates et al., 2011). In other studies, including varied chronic disease populations, HC was found to be effective in increasing self-efficacy (Dennis et al., 2013). Barakat argued that unchanged self-efficacy may be interpreted as a positive outcome, given self-efficacy to be active usually decreases over time in cancer survivors (Barakat et al., 2018). Most recently Ristevsk et al. (2020) also found a 35% increase in home-based exercise activity after the implementation of an internet-based HC intervention.

Other studies found that HC did not significantly affect PA (Hawkes et al., 2013; Yun et al., 2020). However, Yun et al.'s study's HC protocol was not deemed feasible with an intervention completion rate of 59.8% (Yun et al., 2020). This low completion rate combined with a high attrition rate (51.1%) in the HC group is a threat to internal validity (Schulz & Grimes, 2002) and necessitates questioning of the HC protocol used. Indeed, other studies show good feasibility of HC interventions if they are participant-centred (Gell et al., 2017; Gell et al., 2020; Hawkes et al., 2013; Samdal et al., 2017). Finally, while Hawkes et al.'s work did not show an immediate effect on PA levels, they did find a significant maintenance effect associated with the HC intervention. This finding was supported by a recent study on PA level maintenance in cancer survivors (Gell et al., 2020).

There are overall positive signs that HC may be effective in supporting maintenance of PA levels in cancer survivors (Gell et al., 2020; Hawkes et al., 2013). However, this area of research needs further exploration. Most HC studies to date in cancer survivors have focused on pain control and have not specifically targeted supporting increases in PA or exercise (Oliver et al., 2001). In rehabilitation and prevention settings, HC has been effective for short term but not long-term PA behaviour change (Dejonghe et al., 2017). Thus, there is a need to identify the

feasibility, benefits, and effectiveness of HC to impact the exercise adherence and maintenance of a home-based exercise program in cancer survivors.

1.6 Hypothesis and Research Objectives

The primary objective of this study was to investigate the feasibility of an online exercise maintenance program supported with HC for cancer survivors. A secondary objective was to provide preliminary evidence of the impact of a HC-supported exercise maintenance program on PA levels, psychosocial well-being, symptom management, and coping with COVID-19 physical distancing. We hypothesized that an online exercise program supported with HC would be feasible, as indicated by a class attendance rate of $\geq 70\%$, a HC completion rate of $\geq 80\%$, and an assessment completion rate of $\geq 70\%$. Adverse events, recruitment rate, and fidelity of the HC and the exercise class protocol were also reported. In the exploratory work, we hypothesized that the HC-supported exercise intervention would positively impact outcomes as measured by PA levels, psychosocial well-being, symptom management, and coping with COVID-19 physical distancing measures, more so than the exercise only group. The qualitative inquiry aimed to understand the participants' perceptions on the feasibility of completing assessments, participating in synchronous online exercise classes and weekly HC calls, as well as understand how the intervention may have prepared them to be successful in maintaining being active.

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Chapter Two: **Methods**

2.1 Study Design

This study is a pilot randomized controlled trial (RCT) with a two-armed parallel design and 1:1 allocation ratio. An embedded mixed-methods approach was used by including semi-structured interviews after completion of the intervention (Creswell & Clark, 2017). The embedded study design was guided by a pragmatic philosophy as described by Morgan (2014). Ethical approval was obtained by the Health Research Ethics Board of Alberta – Cancer Committee (HREBA.CC-19-0206), and the study was retrospectively registered as a clinical trial (NCT04751305) due to a rapid switch to online programming caused by COVID-19.

2.2 Study Setting

Due to the nature of the COVID-19 pandemic physical distancing measures, all components of the study were held over an end-to-end encrypted version of Zoom. The study was conducted in Calgary, Alberta, and only previous ACE participants from the greater region of Calgary were eligible. Two waves of the study were conducted, with the first wave starting in May 2020 and the second wave starting in September 2020. Due to delayed ethical approval, the first wave of the study was eight weeks long, whereas the second wave was the initially planned twelve weeks in duration.

2.3 Recruitment

Recruitment was based on a convenience sample of participants who had previously completed the ACE baseline program, a 12-week group-based exercise program under the supervision of a clinical exercise physiologist. Recruitment for the 8-week and 12-week wave were in May 2020 and August 2020, respectively. Participants were contacted through email, via the ACE participant list for Calgary-based locations only. Participants interested in a home-based

program were provided with additional information about the ACE maintenance study, including randomization to the additional HC support. Consent was completed online by those interested in the home-based program.

2.4 Participants

ACE participants are adults who have received a cancer diagnosis of any type and stage, who were within three years of cancer treatment completion (further information on ACE participant criteria can be found in the protocol (McNeely et al., 2020). Participants were screened for eligibility for the HC maintenance study by the first author. The inclusion criteria were: 1) being 18 years or older; 2) Completed an ACE baseline program (online or in-person); 3) have access and be familiar with using a computer, laptop, or tablet with a video camera (with the Zoom app installed); 4) have access to an internet connection strong enough to support a live video broadcast; and 5) be able to provide written informed consent in English. Additional screening occurred through a cancer-specific intake form and the Physical Activity Readiness Questionnaire (PARQ⁺), which were both reviewed by a certified exercise physiologist (CEP) as described in further detail in the ACE protocol (McNeely et al., 2020).

2.5 Randomization

Participants were aware that they would be assigned randomly to one of two groups. After completion of all the baseline assessments, a random sequence was generated using an online randomization program (Plous, 1977), with a 1:1 allocation ratio to either the online exercise maintenance program or to the online exercise maintenance program plus HC support. All participants received the exercise maintenance program, which consisted of online exercise classes, an additional home-based exercise program PDF, and a Garmin Vivosmart4 activity tracker. The HC intervention group received additional weekly HC calls. Participants and the health coaches were not blinded to group allocation due to the nature of the HC intervention.

Class instructors and outcome assessors for the physical functioning assessments were blinded to group allocation (participants were instructed not to discuss HC during class or assessments).

2.6 Online ACE Maintenance Program

The online ACE maintenance program consisted of three components: 1-the online exercise classes; 2-the unsupervised home-based program; and 3-the Garmin activity tracker. All behaviour change techniques used in the intervention are shown in Table 1.

2.6.1 Online Exercise Classes

All participants received the online delivered group-based exercise classes. The classes were instructed by a Clinical Exercise Physiologist (CEP) through the Zoom application and were focused on strength and endurance. The exercise classes consisted of 3-4 exercise circuits (i.e., series of exercises), with the last circuit focused on core stabilizing muscles. Each circuit was repeated twice, and each consisted of an exercise focused on a major muscle group, an exercise focused on a minor muscle group, and a cardio exercise. The exercise difficulty and amount were increased over the course of the intervention (i.e., exercise progression; details provided in Appendix A). The exercise circuits were designed so that no exercise equipment was required. Alternative options and modifications to exercises were provided by the instructor, and exercises were tailored based on the individual's exercise experience, functionality, and the accessibility of equipment. Each class was monitored by a moderator who assisted the CEP lead instructor by watching for participant safety during class. To ensure safety in the home setting and the ability to respond immediately to emergencies, participants were instructed to inform the moderator when they were moving out of the visual field of the Zoom application, and participants provided their address and emergency contact information at study start. The moderator role was performed by the first author. Before each exercise class, a reminder email with the upcoming class circuits and the Zoom link was sent out to the participants. Each class

was an hour long, with 10 minutes of warmup, 40 minutes of exercise circuits, and 10 minutes of stretching at the end. Fifteen minutes before each class, the instructor was available for exercise-specific questions. After each class, the moderator facilitated a post-class discussion intended to foster social support, evoke thought about an active lifestyle, and offer the opportunity for questions. The first author and the exercise instructors met each week to discuss the fidelity of the protocol, potential considerations for individual participants, and discuss the upcoming exercise class plan. The classes were offered twice a week for the first two weeks of the program and then reduced to once a week for the remainder of the study. The tapered design of the exercise classes was chosen to first install familiarity with the exercises in a home setting, and then foster the maintenance of unsupervised physical activity (PA) through self-motivation to complete additional exercise prescription independently. No restrictions to engaging in other structured PA classes were made, since we aimed to encourage participants to be active in whatever way they chose.

2.6.2 Unsupervised Home-based Program

To support the participants in exercising on their own, a PDF of a home-based general exercise program prescription with embedded video links was sent out to all participants at the beginning of Week 3. This program consists of six different circuits with three different intensity levels (two low; two moderate; two high intensity). The program was designed to promote self-efficacy by giving the participant the opportunity to control the intensity, duration and type of exercise based on their needs and daily fluctuations in energy and fatigue.

2.6.3 Activity Tracker

All participants received a commercially available activity tracker (Garmin Vivosmart4). Participants were instructed to download the Garmin Connect application and log in with a study account to connect the account with the tracker. Participants were asked to wear the tracker

during waking hours and were allowed to use the Garmin to whatever extent they desired. To reduce participant burden, no reminders to adhere to activity tracker wear time were sent out. The Garmin tracker was used to collect an objective measure of PA and was not intended to be an active part of the intervention. Usage of the device was assessed at the end of the intervention, and no restrictions on using additional apps or wearing additional activity trackers were made.

Table 1. Behaviour Change Techniques (BCT) Incorporated in the Online Maintenance Program

BCT domain	BCTs
2. Feedback and monitoring	2.1 Monitoring of behaviour by others without feedback 2.3 Self-Monitoring of behaviour
3. Social Support	3.1 Social support (unspecified) 3.2 Social support (practical) 3.3 Social support (emotional)
4. Shaping knowledge	4.1 Instruction on how to perform a behaviour
5. Natural consequences	5.4 Monitoring of emotional consequences
6. Comparison of behaviour	6.1 Demonstration of the behaviour
8. Repetition and substitution	8.7 Graded tasks
9. Comparison of outcomes	9.1 Credible source
10. Reward and threat	10.4 Social reward
12. Antecedents	12.5 Adding objects to the environment

*The BCTs are based on the taxonomy by Michie et al. (2013)

2.7 Health Coaching Intervention

In addition to all aspects of the program described above, participants randomized to the HC intervention received weekly individual HC calls. HC was structured based on Wolever et al.'s definition, which emphasizes that HC has to be participant-centred, built on a coach-participant relationship, and include participant-determined goals, a self-discovery process to

find solutions, patient accountability, and education (Wolever et al., 2013). Before each HC call, the participants received a short questionnaire on fatigue, QoL, stress, loneliness, and social support, enabling tailoring of the HC call to the individual (Appendix B). Participants were informed that their answers would not be used for data analysis but for the sole purpose of tailoring the upcoming HC call. This questionnaire was automated and sent out one day before the scheduled HC call. Educational topics were discussed in the following order: Goal Setting, Monitoring Behaviour, Barrier Management, Social Support, Stress Management, Adapting the Program, Self-Compassion, Sleep & Nutrition, Reflection, Health Media, Remote Resources, and Maintaining Motivation (for detailed information on each educational topic see Appendix C). However, the order of the educational topics could be adjusted based on the specific participants' needs each week. Based on the interests expressed by participants in the HC calls in the 8-week wave, the educational topics Self-Compassion, Sleep & Nutrition, Reflection, and Health Media were added to the 12-week wave. Each HC call was structured similarly, starting off with a reflection on the previous week, a conversation about the educational topic, and finishing with an action plan for the upcoming week. Based on participant interest, a summary sheet of the educational topic was sent to the individual. At the half-way point of the intervention, the participant provided feedback on the HC calls, ensuring optimization of HC. All health coaches were graduate students trained in behaviour change strategies and exercise oncology, and had extensive experience with the larger ACE program. The weekly HC calls were held via Zoom and at a convenient time for the participant. The length of each call was dependent on the participant's needs. No restrictions on receiving additional counselling or coaching from outside sources were made. All behaviour change techniques used in the HC intervention are shown in Table 2.

Table 2. Behaviour Change Techniques (BCT) Incorporated in the Health Coaching Intervention

BCT domain	BCTs
1. Goal setting and planning	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 1.4 Action planning 1.5 Review behaviour goals 1.6 Discrepancy between current behaviour and goal 1.7 Review outcome goals 1.9 Commitment
2. Feedback and monitoring	2.2 Feedback on behaviour 2.3 Self-Monitoring of behaviour 2.4 Self-monitoring of outcome of behaviour 2.7 Feedback on outcome of behaviour
3. Social Support	3.1 Social support (unspecified) 3.2 Social support (practical) 3.3 Social support (emotional)
4. Shaping knowledge	4.1 Instruction on how to perform a behaviour
5. Natural consequences	5.1 Information about health consequences 5.4 Monitoring of emotional consequences 5.6 Information about emotional consequences
6. Comparison of behaviour	6.1 Demonstration of the behaviour
8. Repetition and substitution	8.2 Behavior substitution 8.6 Generalization of a target behaviour 8.7 Graded tasks
9. Comparison of outcomes	9.1 Credible source
10. Reward and threat	10.4 Social reward
13. Identity	13.2 Framing/ reframing
15. Self-belief	15.1 Verbal persuasion about capability 15.3 Focus on past successes

*The BCTs are based on the taxonomy by Michie et al. (2013)

2.8 Timeline

The timeline of both waves' intervention components can be seen in Figure 1.

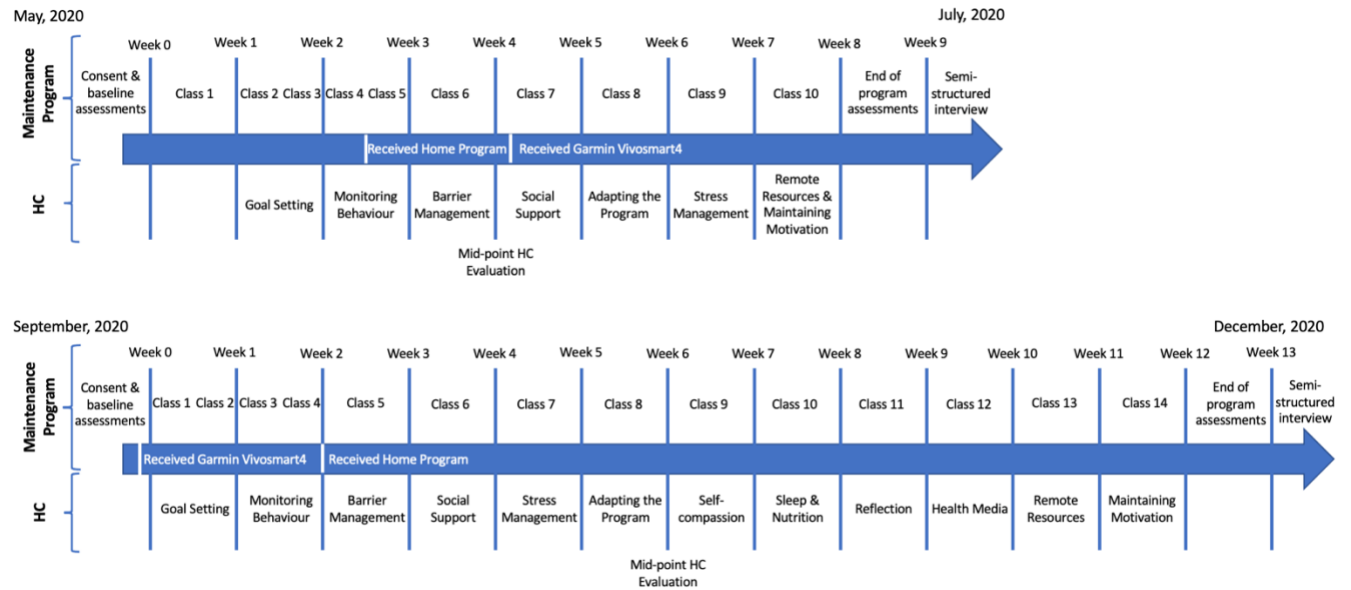


Figure 1: Timeline of the Intervention for the 8-Week and 12-Week Group

2.9 Primary Outcome Measures

2.9.1 Quantitative Feasibility

Feasibility outcomes included recruitment rate, completion of assessment and interventions, the fidelity of the interventions, safety (adverse events reporting), and attrition rate.

2.9.1.1 Recruitment Rate

The recruitment rate was calculated as the percent of those that participated in the study from those eligible.

2.9.1.2 Completion of Assessments, Exercise Classes, & Health Coaching Calls

Completion rates were reported as the percent of the assessment, class, or HC call completed as intended. The physical functioning assessments were deemed feasible if at least

70% of the intended physical functioning assessments were attended and at least 70% of the tests within the physical functioning assessment were completed. Questionnaires were deemed feasible if both the overall percentage of questionnaires completed and the overall percentage of questions answered within the questionnaire were at least 70%. A day of wearing the Garmin activity tracker was counted as completion if the participant wore the tracker for at least 10 hours, as used in previous mHealth oncology research (Gell et al., 2017; Hartman et al., 2018). The hours of wear time were calculated using the accel.weartime algorithm developed by RDocumentation (Van Domelen, 2015). Garmin wear time was deemed feasible if the tracker was worn at least 70% of the overall study days. An attendance of at least 70% of the online exercise classes was deemed feasible. For the HC calls, a completion rate of 80% was deemed feasible. These feasibility cut-offs were determined based on previous feasibility research in cancer survivors (Price & Brunet, 2020).

2.9.1.3 Fidelity of Exercise Class and Health Coaching Protocol

Fidelity was calculated based on the percent of the HC and exercise class protocol followed. Two of the HC sessions for each participant were randomly recorded and assessed for fidelity to the HC protocol by an independent assessor (see Appendix D). Immediately before each HC call, the health coach drew an envelope indicating the decision to record. Additionally, for each HC call, the duration and the participant's interest in additional educational resources were recorded. Each exercise class was observed by the first author, who assessed exercise class fidelity by judging the class based on a protocol checklist (see Appendix E) and recorded technical issues. Percent fidelity of the interventions was recorded.

2.9.1.4 Adverse Events and Attrition rate

Adverse events were recorded using a standardized form that evaluated the nature of the event (mild to severe). Attrition was measured by the percentage of participants not completing the intervention.

2.9.2 *Qualitative Feasibility*

The consolidated criteria for reporting qualitative studies (COREQ) 32-item checklist was used for comprehensive reporting of the qualitative component of this mixed methods study (Tong et al., 2007). Purposeful sampling was used which is commonly used in qualitative description studies (Sandelowski, 2000). More specifically Patton's subtype description of convenience sampling was used (Patton, 1990). The goal for the qualitative analysis was to interview half of the participating individuals from each intervention group (Exercise only vs HC and Exercise). This goal was set since it was estimated that half of the participants would provide sufficient data to get a clear understanding of the participants' shared beliefs while allowing for viewpoint differences. Convenience sampling was used by inviting all of the participants that completed the online delivered exercise intervention via email. The email clearly stated the purpose of the interviews and reiterated that participation was voluntary. Convenience sampling was used based on the resources available to the research team and to give all participants a chance to share their perceptions of the interventions. The sampling goal was to ensure an equal representation of the non-HC and the HC group. If the goal of recruiting half of the participants was reached in either of the groups any other volunteering participants from this group were informed that no more interviews are needed but if they are still interested, they can share any specific comments they may have. If one group did not reach the sampling goal follow-up invitations were sent to the members of this group.

The post-intervention semi-structured interviews were audio recorded, saved on a secure server at the University of Calgary and transcribed by the first author. Interviews were held in a one-one setting over the Zoom application at a time of convenience for the participant. The goal of the interviews was to get a more comprehensive understanding of the participants' perspectives on the feasibility of the online exercise maintenance program in terms of assessments and intervention structure. Participants were familiar with the interviewer, either through the exercise classes and/or the HC calls and were aware of the interviews aims. For the complete interview guide please see Appendix F.

2.10 Secondary Outcome Measures

2.10.1 Physical Activity

2.10.1.1 Moderate to vigorous physical activity (MVPA) Minutes

Weekly PA was assessed objectively with the activity tracker (Garmin Vivosmart4). Objective weekly MVPA minutes were calculated by analyzing 60 second epochs of the heart rate (HR) data. The moderate-intensity minutes domain was defined as 55-70% of age-predicted maximum heart rate (HR_{max}), and the vigorous domain was defined as any activity minutes above 70% of HR_{max} (Gil-Rey et al., 2014). HR_{max} was estimated by the formula $HR_{max} = 208 - 0.7 * age$, which has a high reliability in older adults (Tanaka et al., 2001). To be considered for weekly MVPA minute calculation, the tracker had to have been worn for at least 4 valid days. As commonly done in exercise oncology, a valid day was judged by wearing the tracker for at least 10h a day (Gell et al., 2017; Hartman et al., 2018), with non-wear time being defined as 60 consecutive minutes (Matthews et al., 2008).

Self-reported PA levels were also assessed pre- and post-intervention using the modified Godin Leisure Time Exercise Questionnaire (mGLTEQ), a frequently used, valid and reliable measure (Amireault et al., 2015). The GLTEQ-revised asks the amount of time spent doing

strenuous, moderate, mild, resistance, and flexibility exercises for at least 15 minutes in an average week over the past month. MVPA minutes per week were calculated by multiplying vigorous minutes by two and adding them with moderate minutes. The percentage of participants meeting exercise guidelines of 90 MVPA min/week (Campbell et al., 2019) throughout the intervention (Garmin Vivosmart4) and post-intervention (mGLTEQ) was reported.

2.10.1.2 Steps per Day

Average daily steps were assessed throughout the intervention with the Garmin Vivosmart4. This device has not been validated; however, previous studies have shown that other Garmin models (Garmin Vivofit) have a high criterion validity (compared to Actigraph and Yamax Digiwalker SW-701 pedometer) with an interclass correlation coefficient ranging from 0.89 to 0.94 for daily step counts (Šimůnek et al., 2016). The average daily steps of each week were recorded for all participants.

2.10.2 Physical Functioning

Physical functioning assessments were administered via Zoom before (week 0) and after the intervention (week 9 or week 13 in the two waves, respectively) by a CEP blind to intervention allocation. The ACE testing protocol (McNeely et al., 2020) was modified to ensure safety during the online assessment and account for limitations in equipment in a home setting. Specifically, the cardiovascular fitness assessment was a 2-minute step test (instead of the 6-minute walk test used in ACE), the lower extremity flexibility assessment was a chair sit and reach test (instead of the box sit and reach test), and height and weight were self-reported (instead of measured by the research staff). Tests removed from the in-person protocol included grip strength and waist and hip circumference. Measures that followed the same procedures as during the in-person assessment included upper extremity flexibility (shoulder range of motion),

balance (a one-legged stance with open eyes), and muscular endurance (30 second sit-to-stand; McNeely et al., 2020).

2.10.2.1 Upper extremity flexibility

Shoulder range of motion (ROM) was assessed by asking the participant to position themselves parallel to the device being used for the Zoom call, lift the arm closest to the screen up in a straight line parallel to the sagittal plane, and stop at the furthest point without arching their back. A screenshot was taken at the furthest ROM and analyzed after the assessment with a goniometer. Each shoulder was measured twice, and the average score of each side was recorded.

2.10.2.2 Lower extremity flexibility

Hamstring flexibility was assessed through a seated one-leg extension and reach test with a yardstick or tape measure. The participant was given instructions to hold a hamstring stretch for 30 seconds on each side to familiarize them with the test and reduce the risk of injury. For the test, the protocol outlined by Jones et al. (1998) was followed. The only deviation from Jones et al.'s protocol was that the participant or a family member measured the distance to or from the toes while being instructed and observed by the assessor. The participant had two attempts, and the highest attempt was recorded to the nearest 0.5 cm. The criterion validity of this test compared to the reference test (goniometer measurement of a passive straight leg raise) was 0.76 and 0.81 for males and females, respectively. The intraclass test-retest reliability was excellent, with 0.92 and 0.96 for males and females, respectively (Jones et al., 1998).

2.10.2.3 Balance

Balance was assessed through an eyes-open one-legged stand with a cap at 45 seconds that is validated and reliable (Franchignoni et al., 1998). For the test the protocol outlined by

Franchignoni et al. (1998) was followed. Each leg was assessed once, and the time was recorded to the nearest 0.1 second (Springer et al., 2007).

2.10.2.4 Muscular Endurance

Muscular endurance was measured through the validated, and reliable 30-seconds sit-to-stand test (Eden et al., 2018; Jones et al., 1999). The test measures the times a subject can get up from a seated chair position in 30 seconds. The protocol outlined by Jones et al. (1999) was followed.

2.10.2.5 Cardiovascular Fitness

Cardiovascular fitness was assessed through the 2-minute step test. In this test the number of steps with the knee above the midway point from the patella to iliac crest in 2 minutes was counted. The protocol outlined by Rikli and Jones (1999) was followed. The participant was asked to complete the test perpendicular to the camera and ideally next to a background that allowed for easy detection of each leg during the Zoom call. This measure is commonly used in older adults and has a moderate validity to assess cardiovascular fitness (Johnston, 1999).

2.10.3 Patient-Reported Outcomes

Patient-reported outcomes were administered at baseline and post-intervention through a closed survey on SurveyMonkey. Participants received an email with a unique survey link. The survey consisted of 78 questions, was optional, and did not include any incentives for completion. Participants' responses were de-identified by replacing their registration email addresses with study IDs for analysis. The description of the surveys used was based on the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (Eysenbach, 2004). The complete questionnaire battery can be found in Appendix G.

2.10.3.1 Quality of Life (QoL)

QoL was assessed through the functional assessment of cancer therapy general scale (FACT-G). The change in the overall FACT-G score as well as the score of each domain subscale (physical well-being, social/family well-being, emotional well-being, and functional well-being) was evaluated. This tool has shown to be simple and fast to complete while still having high reliability and validity across cancer age groups (Cella et al., 1993; Overcash et al., 2001).

2.10.3.2 Fatigue

Fatigue was assessed through the functional assessment of chronic illness therapy fatigue scale (FACIT-F). The 13-item fatigue subscale has been commonly used in the cancer population and is reliable and valid (Yellen et al., 1997).

2.10.3.3 Barrier Self-Efficacy

Barrier self-efficacy was assessed using a scale developed based on the most common barriers for cancer survivors (Rogers et al., 2006). The scale consists of nine barriers, and the participant was asked how confident they are to exercise despite these barriers. The scale has a high internal consistency and good test-retest reliability (Rogers et al., 2006).

2.10.3.4 Stress, Loneliness, & Social Support

Stress, loneliness, and social support were assessed through the Perceived Stress Scale (PSS), the short form of the UCLA Loneliness Scale (ULS-6), and the Oslo Social Support Scale (OSSS-3), respectively. The 10-item PSS is a simple and widely established scale that has acceptable psychometric properties (Lee, 2012). The 6-item ULS-6 is a brief, reliable, and valid measure of loneliness (Neto, 2014). The 3-item OSSS-3 is a short, reliable and valid measure of social support (Kocalevent et al., 2018).

2.11 Data Analysis

2.11.1 Sample Size

Since this is a pilot study testing feasibility of the intervention, a sample size calculation was not conducted, but the aim was to recruit 12 participants per group (Julious, 2005).

2.11.2 Data Management

The data collected in this study were stored on a secure server at the University of Calgary. The data was de-identified by assigning a unique Study ID to each participant. Only the first author and designated research staff had access to the personal information (full name, email, and phone number) of the participant. A Garmin account was created for each participant with a unique University of Calgary email address and password. The Garmin account entailed no personal information except for birth year, sex, height, and weight. These variables had to be included to optimize activity tracking. A Health API connection between Garmin and the University of Calgary was built to ensure access to precise heart rate data. Personal information and names mentioned in the semi-structured interviews were modified to reduce the risk of identifying participants based on their statements. The data analysis will be done after the data collection is completed and no interim analysis will be conducted.

2.11.3 Quantitative Analysis

The demographics of the study sample were reported descriptively through means and standard deviations for continuous variables as well as through frequencies for categorical or ordinal data. The feasibility data were reported descriptively and comparisons between the HC and the non-HC group were made. The baseline results for both waves were compared to test for homogeneity among the variables including cardiovascular fitness, minutes of weekly MVPA, BMI, and age. If the two waves were significantly different at baseline, the two waves'

secondary outcomes were examined separately. If no significant differences exist, the data sets were combined in the analysis.

All continuous variables of the secondary outcomes and their change scores (from pre to post) were tested for normality by evaluating histograms, box plots, QQ-plots, the Shapiro-Wilk test of normality, and by comparing means to medians. If all assumptions were met and the waves were combined, between-group differences in the secondary outcomes over time were tested with a one-way analysis of variance (ANOVA) (group [HC vs. Non-HC] x time [pre- vs. post-intervention]). If the assumptions were not met, a Kruskal-Wallis Test was run. If there were significant differences between the baseline results of both waves and variables were normally distributed, they were reported as means and standard deviations. If variables were non-normally distributed, medians and interquartile ranges (IQR) were reported. According to recommendations for pilot trials, emphasis was set on standardized mean differences and confidence intervals, rather than the p-value itself (Lee et al., 2014). The standardized mean difference of the change scores between the intervention groups was calculated and the effect sizes and its confidence intervals were reported as suggested for pilot studies (Lee et al., 2014). According to Cohen 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992). For variables of a dependent sample with the same sample size Cohen's d was calculated. For variables with different sample sizes, Hedge's g was calculated. Both effect sizes were calculated with the formulas illustrated by Ialongo (2016) through the effect size calculator by Lakens (2013) (in this spreadsheet, Lakens's calls the Hedge's g formula by Ialongo (2016) Cohen's d_s). Additionally, change scores were compared to the minimal clinical important difference (MCID), if available for that outcome. MCID's are defined as the smallest difference perceived by the participant as beneficial or harmful (Revicki et al., 2008) and a list of the

MCID's used in this study can be found in Appendix H. Participants were asked on their general usage of the Garmin Vivosmart4 during the questionnaire (only 12-week wave) and the interview (8- & 12-week wave) to report the extent to which the activity tracker could have been an effect measure modifier. Using a gadget twice a week or more frequently was judged as frequent usage. All data analysis was performed using SPSS statistics, version 26 (IBM). The analysis followed intent-to-treat by including all data obtained from randomized participants irrespective of intervention adherence or completion.

2.11.4 Qualitative Analysis

A pragmatic philosophical lens was used with qualitative description being the guiding framework, to develop interview segments into themes, and for comparison and compilation across participants. The ontology used in this qualitative inquiry is based on David Morgan's interpretation of pragmatism, which acknowledges that one reality exists, however, this reality can only be encountered through experiences and therefore knowledge of that reality is socially constructed (Morgan, 2014). Pragmatism focuses on generating experiential knowledge to address practical problems (Morgan, 2014), and is well suited to the aim of finding feasible and effective solutions that will aid cancer survivors in maintaining PA. This ontology aligns with the research question, since it focuses on the usefulness of knowledge, rather than answering questions regarding truth or reality. The epistemology of this study is that "all knowledge of the world is based on experience". Therefore, all knowledge obtained about reality can never be distinct from the human experience and we can only identify shared beliefs. However, identifying and incorporating the shared beliefs of the study participants allowed us to get a better understanding of the support needed to maintain PA and ultimately improve future programing that may or may not include HC. The methodological approach used is qualitative description with an illustrative analysis. Qualitative description focuses on the shared beliefs of

participants and is concerned with describing and summarizing the accounts with a focus on shared meaning expressed by participants (Sandelowski, 2000). An illustrative analysis aims to use qualitative responses to elucidate how and why quantitative results were found (Morgan, 2014). To fully understand and identify the shared beliefs the primary author read through the transcripts before initial coding. Next the shared beliefs were grouped as subcategories under the four main categories. Throughout the analysis the author stayed close to the transcript and simply describe the content by assigning quotes to shared beliefs. After the first round of coding the author discussed the findings with the primary investigator who is an expert in the field and refined codes as applicable. The author then went back through the transcripts using the refined codes. Once coding was finalized, counting of certain shared beliefs was performed, however, as commonly done in qualitative description this was only a means to an end (Sandelowski, 2000). Therefore, no value judgement was assigned to the counts but rather they served as part of the description of the qualitative data when reporting it. Reporting of the data was a summary of the shared beliefs under the four main categories (Assessments, Online Exercise Classes, HC Intervention, Maintaining Physical Activity). An emphasis was set on addressing the participants concerns by providing pragmatic improvements for future fully powered studies.

The study utilized Lincoln and Guba's criteria to judge the rigor of the qualitative component. The four criteria defined by Lincoln and Guba are credibility, dependability, transferability, and confirmability. These criteria align with the pragmatic paradigm of this study. Credibility is similar to internal validity in quantitative research and therefore addresses whether the researcher represents the participants' perspectives. To achieve credibility the following techniques were used: prolonged engagement, persistent observation, and methodological triangulation. Prolonged engagement occurred as the primary author has been working with this

population for over 3 years and joined them during their weekly exercise classes, as well as was the health coach for some of the participants in the study. Persistent observation was applied through the first author's inquiry of facilitators and barriers to PA maintenance, as well as his research experience in mHealth and other behaviour change tools. Methodological triangulation was achieved via the mixed methods, acquiring information from both quantitative and qualitative data as well as incorporating findings from the existing literature. This enhances the credibility of the data, pulling from multiple sources.

Transferability is similar to external validity in quantitative research, focusing on how the findings could apply to the larger population being studied. The technique used to ensure transferability was an audit trail. By providing an audit trail, the reader can form his/her own opinion on the transferability of the findings (Lincoln & Guba, 1985).

Dependability is analogous to reliability in quantitative research, focusing on the consistency of data over time or circumstances (Burke, 2016). An audit trail was also used to ensure dependability, which provides a detailed description of the work flow and decision making during the analysis (Burke, 2016).

The final criterion used to judge the quality of the qualitative inquiry is confirmability, which is analogous to objectivity in quantitative inquiry. Therefore, the focus of confirmability is to ensure that the findings are clearly derived from the qualitative data (Burke, 2016). The previously mentioned audit trail was used to ensure confirmability. Additionally, expert checking was performed by meeting with the primary investigator after the initial coding to discuss the themes and codes created. Finally, evidence was provided in the form of quotations to ensure that the interpretation of the findings aligns with the qualitative data (Whittemore et al., 2001).

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Chapter Three: Results

3.1 Participants

The study included a total of 40 participants (25 participants in the 8-week wave and 15 in the 12-week wave). The mean age was 56.0 ± 9.0 years and the majority of study participants self-identified as European (82.5%) and female (92.5%). The most common cancer diagnosis was breast cancer (70.0%) and more than half of the participants were on active treatment during the intervention (55.0%). The most common treatment was surgery (87.5%), followed by chemotherapy (75.0%) and radiation (62.5%). Half of the participants had previous experience with an activity tracker (50.0%). See Table 3 for a summary of participant demographics, and Figure 1 for study flow, including reasons for study exclusion.

Table 3. Participant Demographics for 8-Week and 12-Week Waves

Group	Wave 1 (8WK)		Wave 2 (12WK)		Total
	HC (n = 12) (Mean \pm SD or n (%))	Control (n = 13) (Mean \pm SD or n (%))	HC (n = 7) (Mean \pm SD or n (%))	Control (n = 8) (Mean \pm SD or n (%))	(n = 40) (Mean \pm SD or n (%))
Age (in years)	59.0 \pm 9.7	54.4 \pm 10.3	53.6 \pm 5.6	56.1 \pm 8.4	56.0 \pm 9.0
Sex					
Female	11	12 (92.3)	7 (100.0)	7 (87.5)	37 (92.5)
Male	1 (8.3)	1 (7.7)	0 (0)	1 (12.5)	3 (7.5)
Education status					
Completed High School	1 (8.3)	0 (0)	0 (0)	2 (25.0)	3 (7.5)
Some University/College	2 (16.7)	0 (0)	0 (0)	1 (12.5)	3 (7.5)
Completed University/College	4 (33.3)	12 (92.3)	4 (57.1)	3 (37.5)	23 (57.5)
Some Graduate School	0 (0)	0 (0)	0 (0)	2 (25.0)	2 (5.0)
Completed Graduate School	5 (41.7)	1 (7.7)	3 (42.9)	0 (0)	9 (22.5)
Employment Status					
Disability	2 (16.7)	6 (46.2)	3 (42.9)	1 (12.5)	12 (30.0)
Retired	6 (50.0)	1 (7.7)	0 (0)	3 (37.5)	10 (25.0)
Part Time	0 (0)	2 (15.4)	1 (14.3)	1 (12.5)	4 (10.0)
Homemaker	2 (16.7)	3 (23.1)	1 (14.3)	0 (0)	6 (15.0)
Full Time	2 (16.7)	1 (7.7)	2 (28.6)	1 (12.5)	6 (15.0)
Temporarily Unemployed	0 (0)	0 (0)	0 (0)	2 (25.0)	2 (5.0)

Marital status					
Married	12 (100.0)	6 (46.2)	7 (100.0)	7 (87.5)	32 (80.0)
Common Law	0 (0)	1 (7.7)	0 (0)	0 (0)	1 (2.5)
Widowed	0 (0)	2 (15.4)	0 (0)	0 (0)	2 (5.0)
Divorced	0 (0)	4 (30.8)	0 (0)	0 (0)	5 (12.5)
Ethnicity					
European	10 (83.3)	12 (92.3)	4 (57.1)	7 (87.5)	33 (82.5)
Indigenous	0 (0)	0 (0)	0 (0)	1 (12.5)	1 (2.5)
East and South Asian	2 (16.7)	1 (7.7)	1 (14.3)	1 (12.5)	5 (12.5)
Latin/Central and South American	0 (0)	0 (0)	1 (14.3)	0 (0)	1 (2.5)
African	0 (0)	0 (0)	1 (14.3)	0 (0)	1 (2.5)
Mixed	1 (8.3)	0 (0)	0 (0)	0 (0)	1 (2.5)
Cancer type					
Breast	6 (50.0)	10 (76.9)	6 (85.7)	6 (75.0)	28 (70.0)
Lung	0 (0)	1 (7.7)	0 (0)	0 (0)	1 (2.5)
Vascular	0 (0)	2 (15.4)	1 (14.3)	0 (0)	3 (7.5)
Gynecological	4 (33.3)	1 (7.7)	0 (0)	1 (12.5)	6 (15.0)
Genitourinary	1 (8.3)	0 (0)	0 (0)	1 (12.5)	2 (5.0)
Head and Neck	1 (8.3)	0 (0)	0 (0)	1 (12.5)	2 (5.0)
Skin	1 (8.3)	0 (0)	1 (14.3)	2 (25.0)	4 (10.0)
Active cancer treatment	5 (41.7)	7 (53.8)	3 (42.9)	7 (87.5)	22 (55.0)
Completed treatments					
Surgery	11 (91.7)	10 (76.9)	6 (85.7)	0 (0)	35 (87.5)
Chemotherapy	8 (66.7)	10 (76.9)	5 (71.4)	7 (87.5)	30 (75.0)
Hormone therapy	2 (16.7)	1 (7.7)	0 (0)	3 (37.5)	6 (15.0)
Biological therapy	0 (0)	1 (7.7)	1 (14.3)	0 (0)	2 (5.0)
Radiation	6 (50.0)	7 (53.8)	6 (85.7)	6 (75.0)	25 (62.5)
Stem cell transplant	0 (0)	1 (7.7)	1 (14.3)	0 (0)	2 (5.0)
Targeted therapy	0 (0)	1 (7.7)	0 (0)	0 (0)	1 (2.5)
Using an activity tracker	4 (33.3)	9 (69.2)	3 (42.9)	4 (50.0)	20 (50.0)

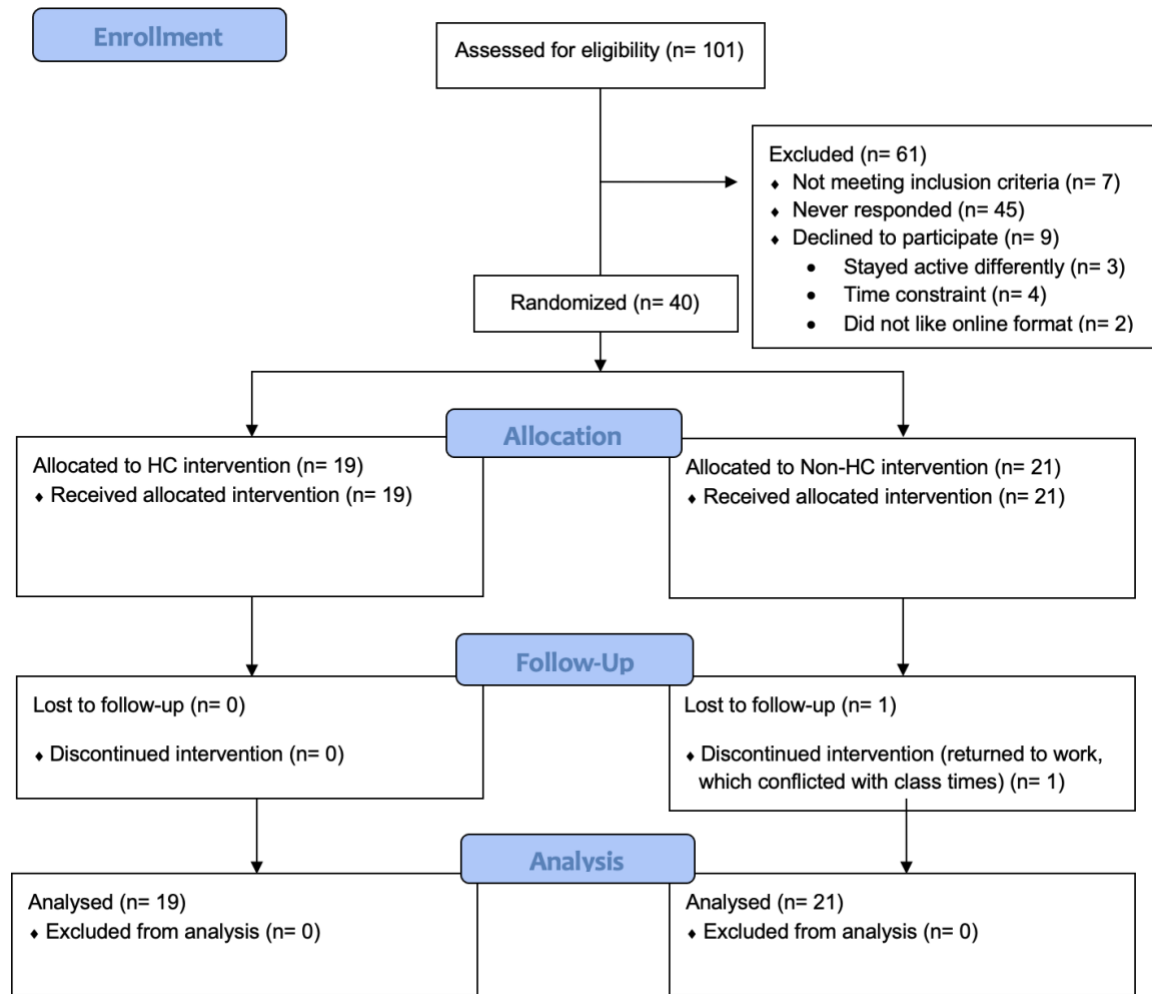


Figure 2. Flow of Participant Recruitment, Randomization, and Attrition

3.2 Feasibility

3.2.1 Recruitment and Attrition

The overall study recruitment rate was 42.6% (see Figure 2). The attrition rate of the study was 2.5% with one participant dropping out after 4 weeks due to returning to work which conflicted with the class time. For the post-intervention semi-structured interviews, 48.7% of the eligible participants (19/39) participated. Out of these 19 participants, 10 were from the non-HC group (10/20; 50.0%) and 9 were from the HC group (9/19; 47.4%).

3.2.2 Online Exercise Class Delivery

The overall attendance rate to the classes was 91.2%, with a 13.5% higher attendance rate for the HC group (94.5%) compared to the non-HC group (81.0%). A similar trend was seen in the post-class session conversation, which had an overall attendance of 88.4%, a HC group attendance of 91.7%, and a non-HC attendance of 78.5%.

Facilitators of attendance reported by participants for the online-delivered exercise program included the convenience (13/19), a reduced concern of visual appearance (4/19), and less exposure for an immunocompromised population (3/19). Under convenience, participants mentioned reduced travel time to the exercise facility, being in the comfort of home, and not being location bound.

But it would have probably been there's probably benefits for both. But you know at 5:00 o'clock in the city, I wouldn't be going to any I wouldn't be driving over to the University and back at 6 like that would be you'd be right in traffic at that time. So that's pretty convenient just to turn on your iPad and get going. (Female, 59, non-HC)

Barriers to online programming attendance included the equipment available, the ability to tailor exercises to individuals, and the reduced chances to connect with other cancer survivors:

I guess that's probably the disadvantage of the virtual, we didn't really get to meet each other on a kind of [...] a more social level before and after class that we normally would've [...] had we been in-person. And I think [...] as much as the virtual was a good backup, in-person would be great. [...] Largely because I think it just gives everybody the support because we've all gone through our own little personal hell. (Female, 59, non-HC)

For the online exercise class structure, most participants preferred to have the classes at least twice a week (18/19) for an hour duration each session (19/19). There were no

adverse events during any of the classes and the participants generally felt safe during classes. Participants noted that the program components that enhanced their feelings of safety included being sent (emailed) the exercise program beforehand, which allowed them to look up a video of each exercise, and always having two exercise oncology trained individuals present during each class:

Yes, but being on camera I think didn't make me worry that I was doing something unsafe because I knew that the instructor and the person that was watching [...] would correct you if there was something that was unsafe. (Female, 60, HC)

The fidelity of the exercise classes was 92.6%, with technical interruptions being most commonly reported (4.4%) as a deviant from the protocol, followed by participants arriving more than five minutes late to class (2.5%) and the class instructor altering the sequence of the exercises (0.5%).

3.2.3 Health Coaching Feasibility

The overall HC call completion was 97.0%. In the 8-week intervention, on average 6.8 out of the offered 7 HC calls were completed. One session was missed by each of two participants, due to vacation and having a migraine. In the 12-week intervention, 11.6 out of the 12 offered HC calls were completed. Two participants did not complete all 12 sessions and reasons for missing calls included contracting COVID-19 and being stuck at work. The mean call length was 34.2 ± 13.2 minutes, with a wide range between participants from 20.2 ± 4.0 to 52.3 ± 11.2 average call length minutes. The length of the calls for each educational topic is summarized in Table 4. The fidelity of the HC protocol was 96.7%.

Based on feedback from participants, key facilitators of the HC intervention included having a connection with the health coach, tailoring the educational topics to the needs of the individual, and having an active listener that keeps one accountable and motivated:

Well, that's how I felt it felt like having somebody there who is not your husband, your spouse, your child, your family member who is there and who is committed to your well-being as much as you are. And who will give you some advice, who will provide a listening ear, who will give you some encouragement, and who will put things [...] into perspective. Because sometimes when you are going through some things as difficult as this [...] somebody who's neutral somebody who's not emotionally involved can have a better opinion of the situation that you're going through. Even though they might not understand it they still can sympathize and say hey there is a light at the end of the tunnel even though you don't see it and I'm here to give you support as much as I can, and find resources as much as I can, and see what I can do. So, it was valuable, like it was really good, I will definitely highly recommend having that. (Female, 48, HC)

When asked about the frequency of the HC calls, most participants preferred once per week since this gave sufficient time to implement the weekly goals while at the same time keeping one accountable.

Table 4. Mean Call Length and the Educational Topic covered during the Call for the 8-Week and 12-Week Wave

Educational Topic	8-Week (n = 12)	12-Week (n = 7)	Overall (n= 19)
Goal Setting	45.4 ± 16.0	38.7 ± 6.6	42.9 ± 13.5
Behaviour Monitoring	37.3 ± 15.4	36.0 ± 9.3	36.8 ± 13.2
Barrier Management	31.7 ± 11.6	35.1 ± 14.5	32.9 ± 12.4
Social Support	29.4 ± 10.3	32.7 ± 15.5	30.8 ± 12.3
Stress Management	31.7 ± 10.5	37.6 ± 14.5	34.2 ± 11.9
Adapting the Program	29.4 ± 8.4	29.0 ± 6.9	28.9 ± 7.7
Self-Compassion	/	40.3 ± 18.9	40.3 ± 18.9
Sleep	/	42.3 ± 20.3	42.3 ± 20.3
Nutrition	/	35.3 ± 14.6	35.3 ± 14.6
Reflection	/	28.5 ± 13.4	28.5 ± 13.4
Health and Media	/	37.4 ± 12.2	37.4 ± 12.2
Remote Resources	/	32.8 ± 18.1	32.8 ± 18.1
Maintaining Motivation	29.5 ± 9.3*	29.6 ± 14.8	29.5 ± 11.2

* For the 8-week intervention Remote Resources and Maintaining motivation was provided as a combined topic

3.2.4 Assessment Feasibility

3.2.4.1 Questionnaire Feasibility

The overall completion rate of questionnaires was 98.8% and within questionnaires, 98.4% of questions were answered. Although questionnaires are clearly feasible and participants appreciated being able to return to complete them at a later time via the online system, participants noted that it would have been helpful to be able to add context or indicate if a question was not applicable:

Right, like as one of our participants was still, he was still going through treatment. So, some of those questions would have been extremely relevant in his case. Whereas I've been out of treatment for a year, and had a really good checkup yesterday by the way, and so yeah, so some of those questions weren't necessarily as relevant to me.
(Female, 53, non-HC)

When asked about the length of the questionnaires, participants did not find them burdensome.

3.2.4.2 Physical Functioning Assessment Feasibility

The completion rate of the physical functioning assessment was 97.5%, with two participants not completing the final assessment. Both participants were in the non-HC group, with one dropping out 4 weeks into the study and the other getting into a biking accident (outside of class time) in the last week of the study.

A key facilitator for assessment completion commonly mentioned by participants was their interest in seeing results:

I found it quite quite easy, and it was kind of neat. I found I [...] maintained most of almost all of my levels and I increased my cardio, so that was good. (Female, 53, non-HC)

Despite the online delivered physical functioning assessment being feasible, some participants did not feel particularly confident in the measurement results. This was especially apparent for the hamstring flexibility measure:

Yeah, that's a little difficult you know, like (laughs), only because I was like, I'm using a ruler to try to measure, [...] how far I can stretch [...] so I'm not sure if it was 100% accurate. (Female, 46, HC)

There were no adverse events or concerns about safety (from the participants interviewed), during the physical functioning assessments.

3.2.4.3 Garmin Vivosmart4 Feasibility

Out of the participants with available data, the tracker was worn ≥ 10 h per day 83.4% of the possible study days. A valid day was defined as wearing the tracker more than 10h per day. The mean number of days a tracker was worn per week was 5.84 ± 1.87 days. No data was obtained from 4 participants, with the reasons being one participant dropped out before receiving the tracker, one participant did not sign the updated consent form regarding Garmin data storage, and two participants synchronized their tracker with a private account instead of the research specific account. One participant received the tracker a week late, due to postal delays, and therefore did not synchronize their tracker until week 2. Between intervention groups, the non-HC group wore the tracker for 84.7% and HC group for 82.1% of the possible days in the study. In both waves, the wear time was over the 70.0% feasibility threshold for the entire time, except for the last week of the 8-week wave. In general, a trend that was visible in both waves was that the wear time was lower in the first and last week of wearing the tracker, as seen in Figure 3.

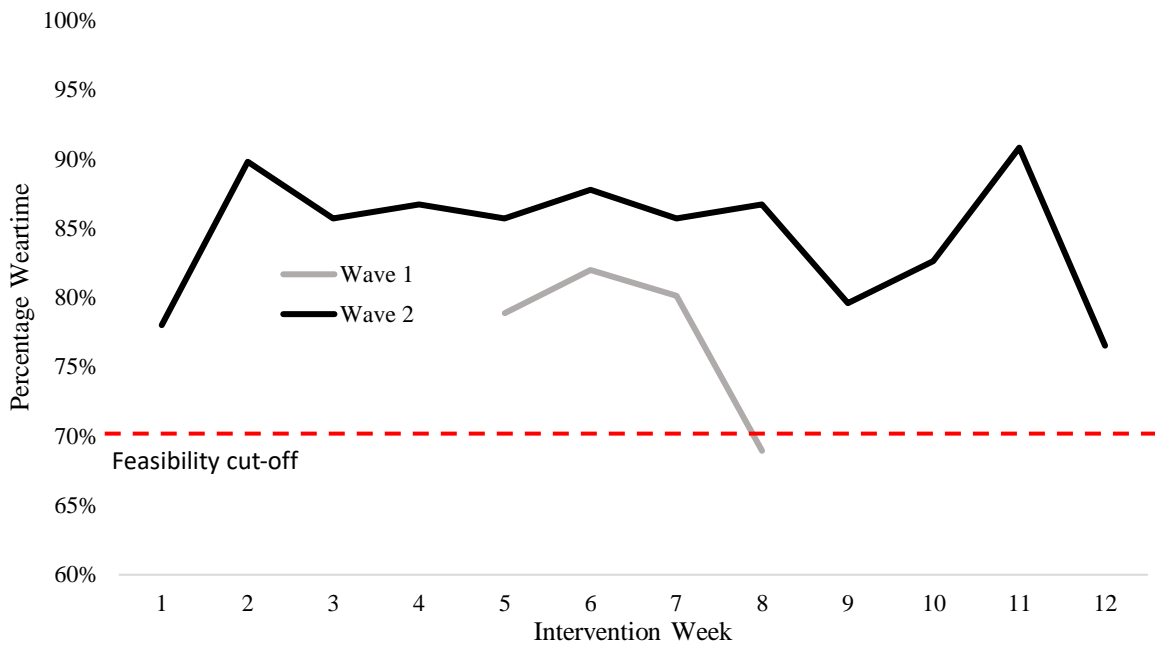


Figure 3. Percent Wear time per Week in the 8-Week and the 12-Week Wave

Facilitators to enhance the wear time of the Garmin were participants' interest in results and the minimalistic design, as stated here:

I think it's pretty compact and looking at some of the others and my husbands, like theirs are wider. And I like this narrow, it's almost non-obtrusive. No, I like it!

(Female, 59, HC)

Barriers to using the Garmin as an objective physical activity (PA) measure were the limited instructions provided and the user-friendliness of the device. The limited instructions provided lead to confusion of the use and set-up of the Garmin devices:

I was talking with you [...] about some other thing and that came up, and I said well, you're not going to get any information for me, because I couldn't get the [Garmin] to work. And [...] that was at that time, you had said to me well, put the [Garmin] on [Participant 2] because it's still going to record anyways. And I didn't realize that I thought you had to enter every time you did some exercise, you had to enter something, and go and find something anyways. (Male, 69, non-HC)

Frustrations about the user-friendliness mainly revolved around the display being too small and the screen not turning on. Movement and heart rate alerts received mixed reviews, with some participants finding them motivating while others finding them interrupting.

The percentage of gadgets on the Garmin frequently used was higher in the non-HC group (68.1%) compared to the HC-group (46.0%). Most participants frequently used the Steps (13/15), Floors climbed (11/15), and HR monitoring functions (11/15). All participants of the 12-week intervention reported using at least one of the gadgets frequently (defined as using the gadget ≥ 2 x per week).

3.3 Secondary Outcomes

The exploratory analysis included the findings on the effect of the interventions on PA maintenance, physical functioning, and patient reported outcomes (PRO). More specifically, PA maintenance was assessed through steps per day and moderate to vigorous physical activity (MVPA) minutes. The physical functioning assessments included measures of flexibility, strength endurance, endurance, balance, and anthropometric measures. The PRO focused on quality of life (QoL), fatigue, barrier self-efficacy, and coping with COVID-19 physical distancing measures (social support, stress, and loneliness).

3.3.1 Differences between waves baseline levels

The two waves were not combined for the exploratory outcome analysis, since the 12-week wave was fitter at baseline compared to the 8-week wave. The baseline cardiovascular fitness test (the TMST) was higher in the 12-week wave (113.1 ± 17.2) compared to the 8-week wave (88.5 ± 16.2), with a large effect size ($g=1.48$). Additionally, median self-reported MVPA levels were higher in the 12-week wave (220 (300)) compared to the 8-week wave (90 (215)) with a moderate effect size ($g=0.52$;). The age (Wave1 = 56.6 ± 10.1 yrs, Wave 2 = 54.9 ± 7.1 yrs, $g=0.19$) and BMI (Wave1 = 27.5 ± 5.4 kg/m², Wave 2 = 26.7 ± 5.3 kg/m², $g=0.15$) of the two waves did not meaningfully differ (based on $g < 0.2$). Since the 12-week

wave was the a priori intended intervention only the results of the 12-week wave were reported (results of the 8-week wave can be found in Appendix I)

3.3.2 Physical Activity Maintenance

3.3.2.1 Steps

In the 12-week intervention the non-HC group increased their mean daily step count over the 12-week intervention, from an average of 9188 ± 2197 , to 9782 ± 1950 mean steps per day (a small effect size; $g=0.29$). The HC group saw a decrease in their mean daily step count from the first week (8758 ± 1875 mean steps/day) to week 12 (7715 ± 2330 mean steps/day) by a moderate effect size ($g=0.50$). Overall, both groups had a large reduction in mean steps per day from week 4 to week 5 (Figure 4).

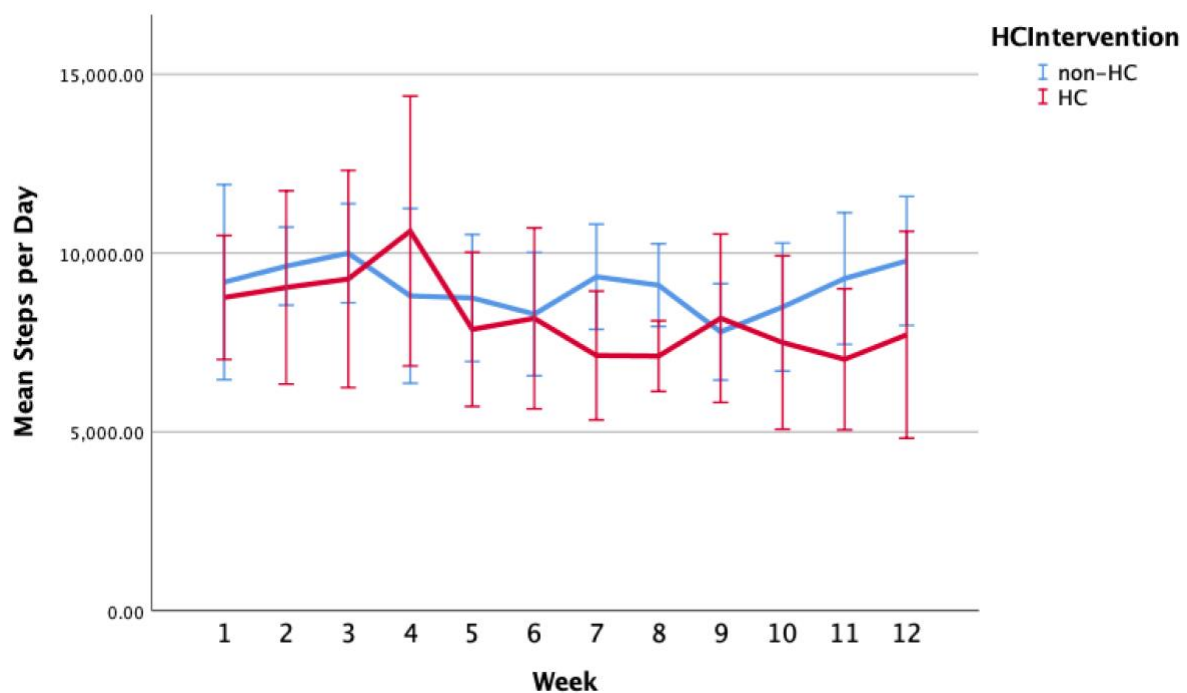


Figure 4. Mean Steps per Day for the Health Coaching (HC) and non-HC Group during the 12-Week Wave

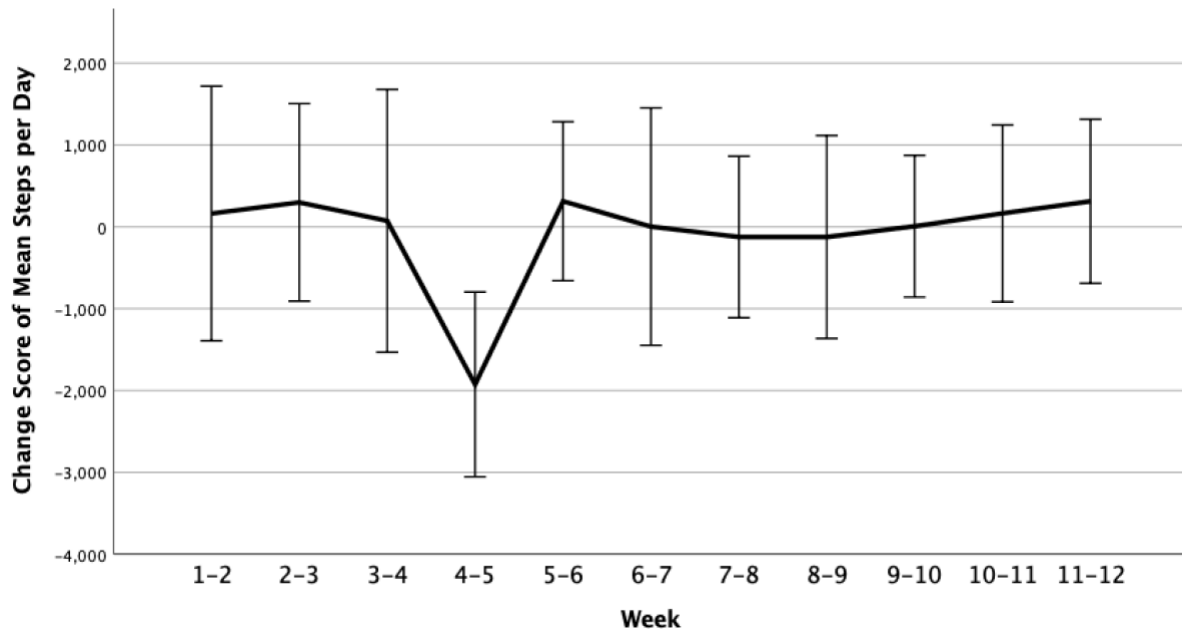


Figure 5. Mean Change Score of Steps per Day for the 12-Week Wave

3.3.2.2 Moderate to Vigorous Physical Activity Minutes (MVPA)

3.3.2.2.1 Subjective MVPA

In the 12-week wave the HC group improved their MVPA minutes from baseline (165.0 ± 132.9 min/week) to post-intervention (229.1 ± 150.8 min/week) by a small effect size ($d=0.45$). When comparing the change scores of HC participants (64.1 ± 101.0 min/week) to the non-HC participants (-31.3 ± 180.8 min/week), the HC group improved by a moderate effect size ($g=0.64$) more so than the non-HC group. These findings were supported by 53.3% of participants improving their MVPA minutes, while 40.0% reduced by at least one MCID, 66.7% of whom were in the non-HC group. Additionally, 66.7% of the participants met the PA guidelines of 90 MVPA minutes per week (Campbell et al., 2019) at the end of the intervention, with 71.4% of the HC group and 62.5% of the non-HC meeting guidelines.

3.3.2.2.2 Discrepancy between objective and subjective MVPA data

The objectively calculated MVPA minutes by Garmin had no correlation with the self-reported MVPA minutes reported through the modified Godin Leisure Time Exercise

Questionnaire (mGLTEQ) (Figure 6). Since there is no correlation between the objective measure and the subjective measure of physical activity, the absolute values of either should be interpreted with caution.

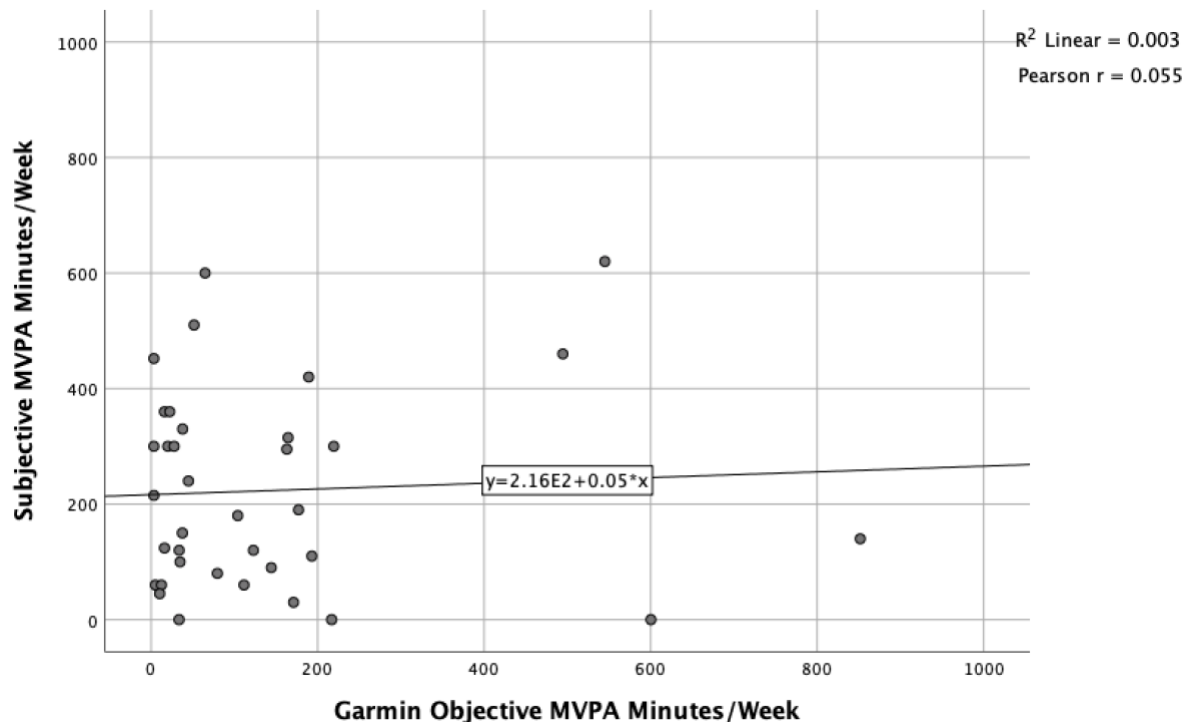


Figure 6. Correlation between the Subjective modified Godin Leisure Time Exercise Questionnaire (mGLTEQ) and the Objective Garmin Vivosmart4 to measure Moderate to Vigorous Physical Activity (MVPA) Minutes per Week

Out of the 19 interviewed participants 11 reported some inconsistencies in the accuracy of the tracker. In general (8/11) participants reported that they felt that the GarminVivosmart4 tended to underestimate compared to their perceptions or other activity trackers. Interestingly, 3 participants mentioned having trouble raising their HR:

I notice that I don't know what it is I can't seem to get my heart rate up like I could be doing burpees and feel like I'm about to pass out and my heart rate is really low so I'm thinking well that's really weird I would have never thought that so one day I'll figure out what that means but at least I know it's happening now. (Female, 48, non-HC)

3.3.2.2.3 Research Algorithm vs Garmin's proprietary Algorithm

The correlation between the MVPA minutes/week determined by the algorithm designed by our research team and the imputed (same imputation as used in our algorithm, see Chapter 5) proprietary algorithm by Garmin revealed a strong correlation ($r = 0.59$; $p < 0.001$). Garmin commonly recorded MVPA minutes of zero, whereas our algorithm overestimated the absolute MVPA minutes (Figure 7). Therefore, our algorithm is not yet specialized to give absolute values of MVPA min/week. However, the data obtained from the research algorithm can be interpreted in relative terms, especially since the code used is transparently reported (see Chapter 5).

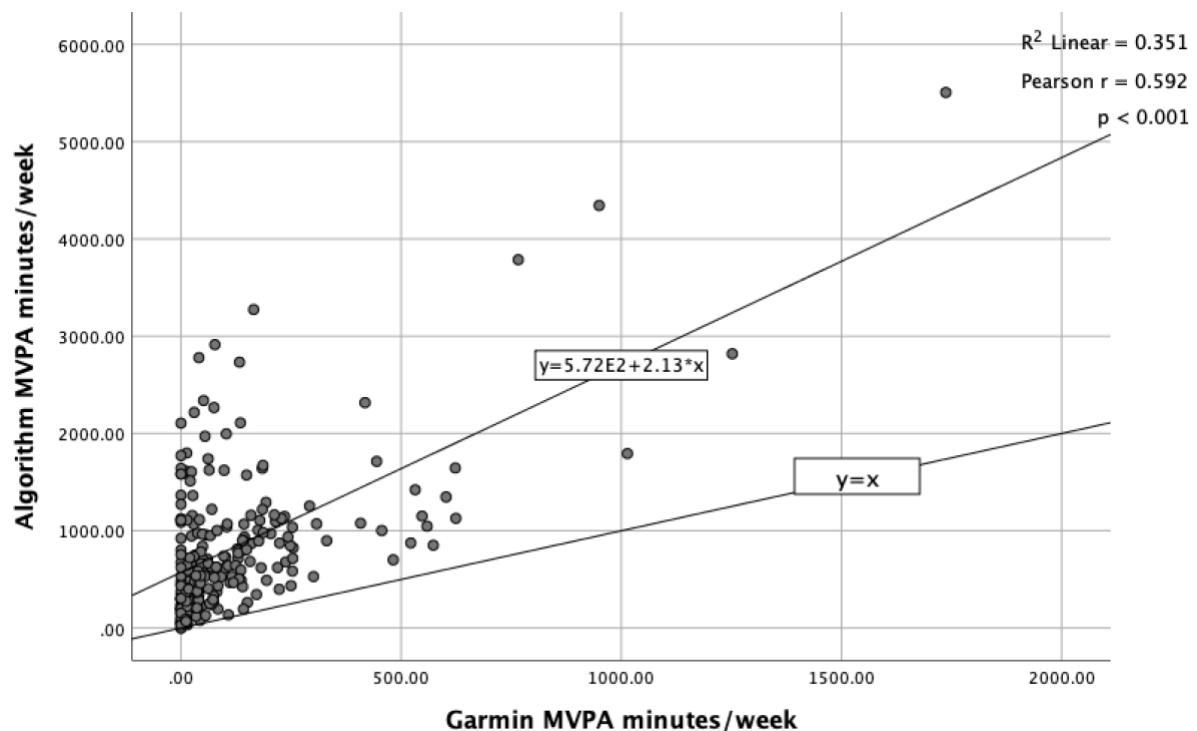


Figure 7. Correlation between the Research Algorithm and the Garmin proprietary Algorithm to determine Moderate to Vigorous Physical Activity (MVPA) Minutes per Week

3.3.2.2.4 Objective MVPA

In the 12-week wave, on average 30.3% of the participants met the exercise guidelines of 90 MVPA min/week (see Table 5). A higher percentage of participants met the exercise guidelines throughout the intervention in the HC group (38.3%) compared to the non-HC group (17.6%). However, this finding should be interpreted cautiously, as the MVPA

min/week in the first week were higher for the HC group (154.3 ± 206.4 min/week) compared to the non-HC group (29.0 ± 27.1 min/week). The HC group's average MVPA min/week exceeded the 90 min/week of MVPA most weeks (9/12 Weeks) despite only 38.3% of the participants meeting the guidelines. This speaks again to the discrepancy between individuals having extreme values (Figure 8 & 9). This finding is supported by the large standard deviations recorded in table 5. and the wide whiskers in figure 10.

Examination of individual data reveals that most participants in the HC group maintained or increased their baseline MVPA levels (Figure 11). Participant 34 was an anomaly, starting off extremely active and then experiencing reduced levels (from week 6 to week 11) to an activity level similar to the other HC participants. In the non-HC group, a similar trend was observed with most participants maintaining or increasing their physical activity throughout the intervention (Figure 12). Participant 27 was an anomaly, recording high levels at the start, increasing these until week 8, and recording vastly lower values in the last two weeks of the intervention.

Table 6. Objective MVPA Minutes per Week and the Percentage of Participants meeting the Exercise Guidelines in the 12-Week Wave

Week	Non-HC			HC			Total
	Research Algorithm MVPA min/week	Garmin* Algorithm MVPA min/week	Percentage of Participants Meeting Exercise Guidelines	Research Algorithm MVPA min/week	Garmin* Algorithm MVPA min/week	Percentage of Participants Meeting Exercise Guidelines	Percentage of Participants Meeting Exercise Guidelines
Week 1	459.75 \pm 179.8	29.0 \pm 27.1	0.0%	1007.9 \pm 896.6	154.3 \pm 206.4	42.9%	27.3%
Week 2	545.0 \pm 285.0	24.5 \pm 19.9	0.0%	918.1 \pm 776.5	129.1 \pm 109.6	42.9%	21.4%
Week 3	717.55 \pm 469.7	51.4 \pm 50.9	42.9%	637.7 \pm 551.3	61.3 \pm 49.6	42.9%	42.9%
Week 4	540.5 \pm 272.5	51.3 \pm 54.8	33.3%	991.2 \pm 746.2	153.6 \pm 184.8	57.1%	46.2%
Week 5	426.0 \pm 178.3	58.3 \pm 34.4	16.7%	987.3 \pm 873.7	139.8 \pm 227.4	28.6%	23.1%
Week 6	547.0 \pm 230.0	58.8 \pm 42.7	16.7%	1047.7 \pm 696.8	111.9 \pm 118.6	42.9%	30.8%
Week 7	516.3 \pm 335.4	56.5 \pm 53.6	33.3%	779.6 \pm 764.2	76.6 \pm 83.4	33.3%	33.3%
Week 8	786.9 \pm	76.4 \pm	33.3%	747.1 \pm	97.0 \pm	42.9%	38.5%

	614.2	75.3		459.7	88.1		
Week 9	527.3 ±	57.0 ±	16.7%	808.1 ±	123.4 ±	42.9%	30.8%
	456.6	66.8		382.8	198.2		
Week 10	470.7 ±	34.8 ±	16.7%	904.0 ±	70.4 ±	28.6%	23.1%
	394.0	71.0		571.8	89.1		
Week 11	655.5 ±	43.6 ±	0.0%	710.8 ±	98.2 ±	42.9%	21.4%
	347.1	32.6		367.5	104.6		
Week 12	535.3 ±	35.7 ±	14.3%	794.2 ±	107.7 ±	40.0%	25.0%
	286.7	48.9		449.3	83.8		
Total			17.6%			38.3%	30.3%

*Imputed as described in Chapter 5

Percentages of participants meeting the exercise guidelines of 90 MVPA minutes per week (Campbell et al., 2019) is calculated based on the imputed Garmin algorithm's data

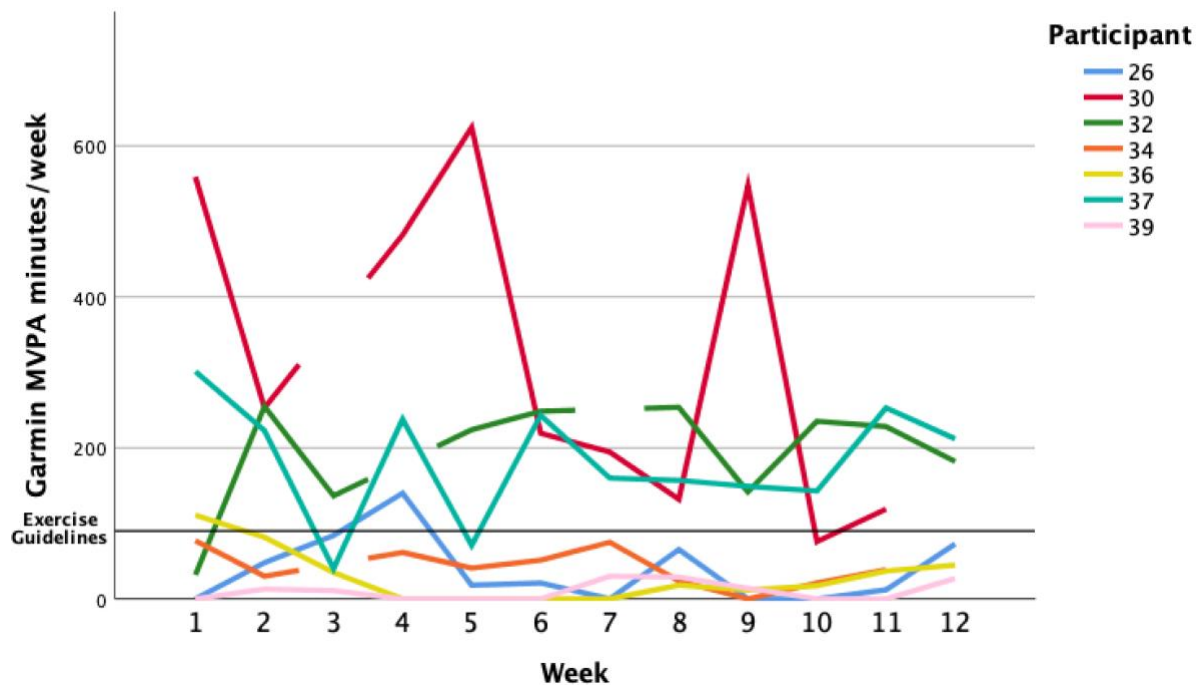


Figure 8. Individual Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the Health Coaching Group During the 12-Week Wave as Measured by the Imputed Garmin Vivosmart4 data

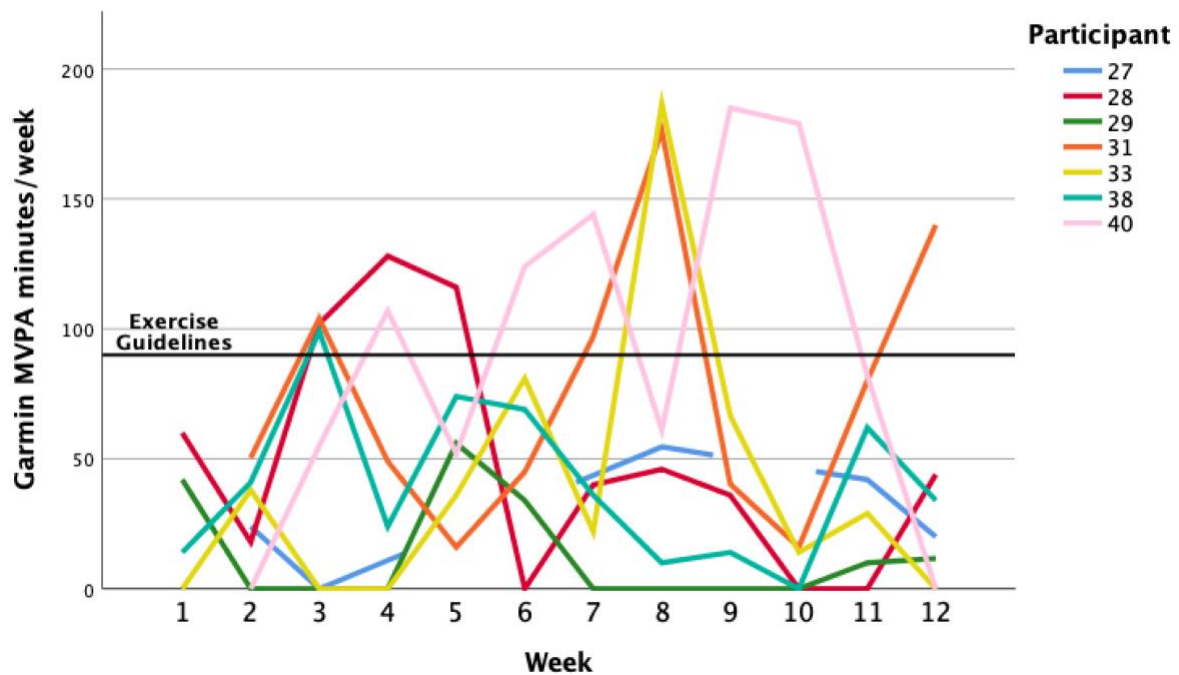


Figure 9. Individual Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the non-Health Coaching Group During the 12-Week Wave as Measured by the Imputed Garmin Vivosmart4 data

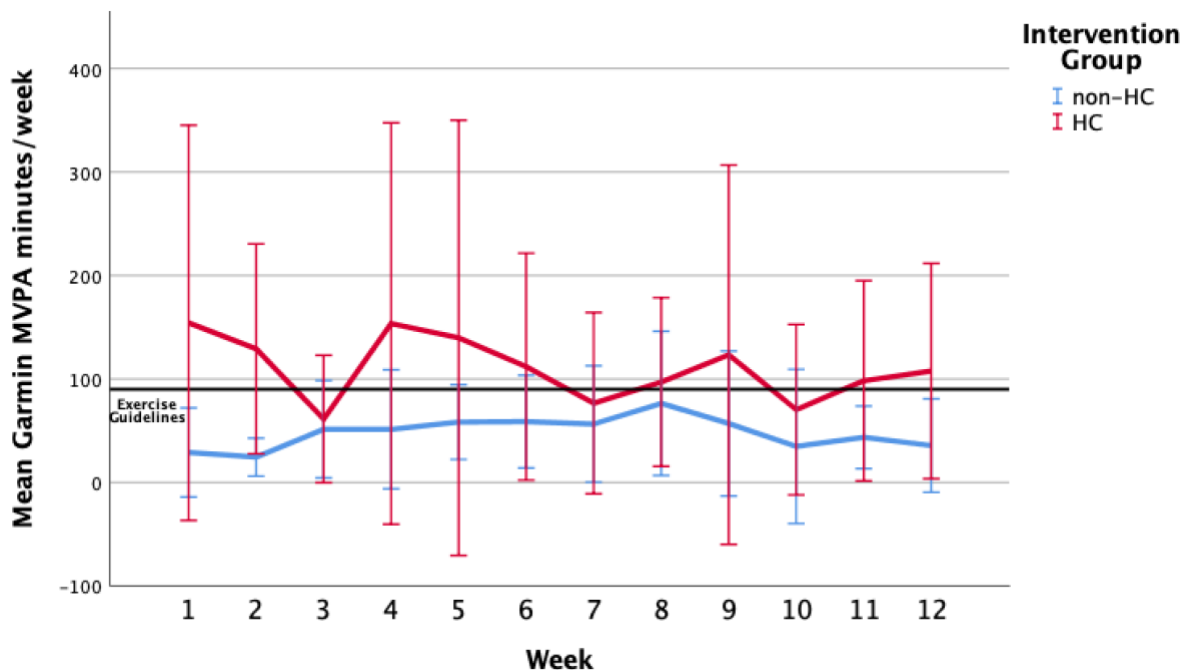


Figure 10. Mean Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the Health Coaching (HC) and non-HC Group During the 12-Week Wave as Measured by the Imputed Garmin Vivosmart4 data

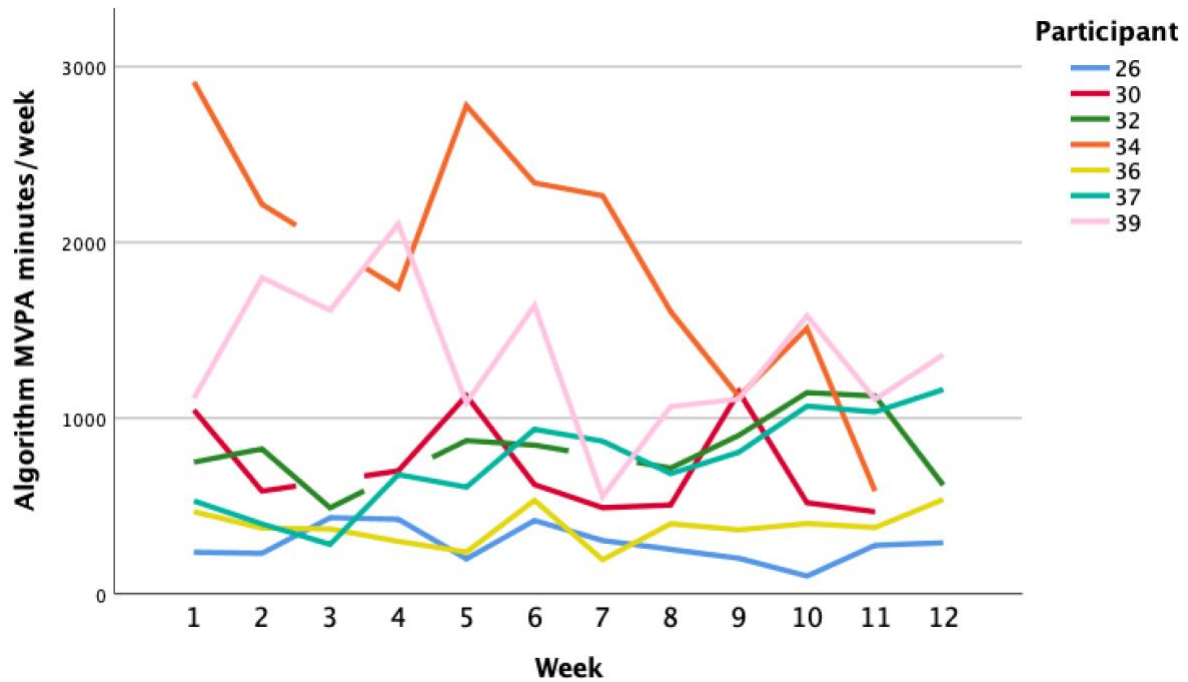


Figure 11. Individual Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the Health Coaching Group During the 12-Week Wave as Measured by the Imputed Algorithm

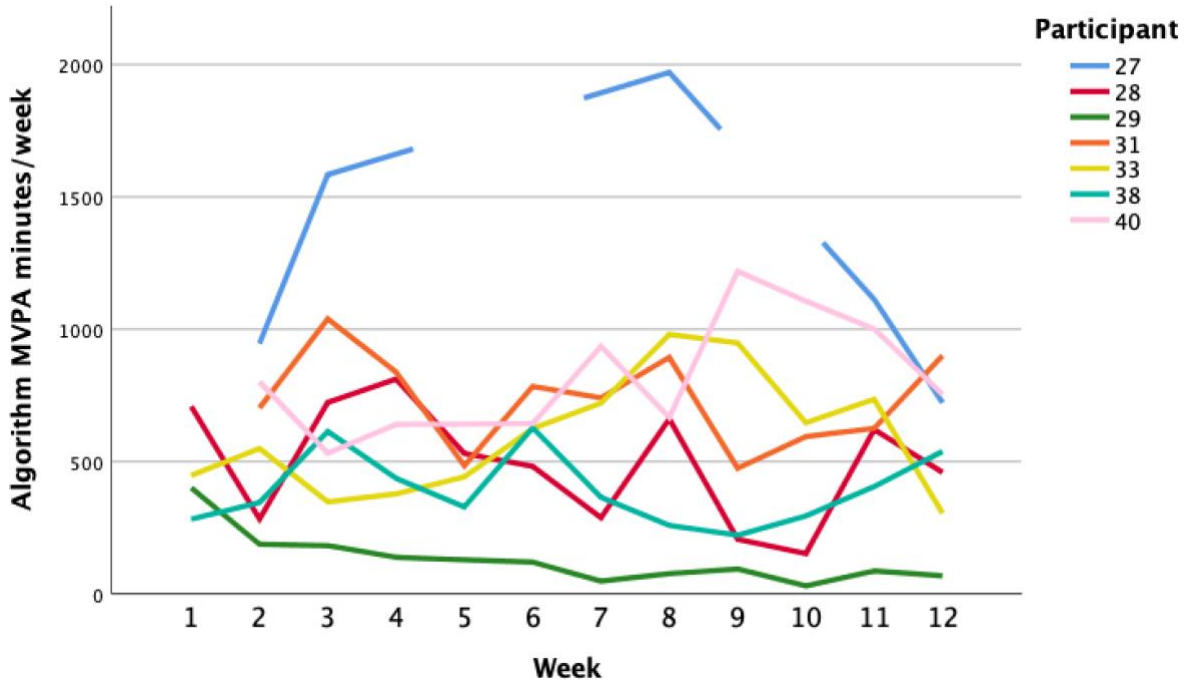


Figure 12. Individual Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the non-Health Coaching Group During the 12-Week Wave as Measured by the Imputed Algorithm

3.3.2.3 Facilitators and Barriers to PA maintenance

Important facilitators identified to maintain physically active during the interviews were having the weekly exercise circuits and the home program, self-efficacy, and planning ahead. Self-efficacy encapsulated statements like identifying as an exerciser, feeling knowledgeable about body and exercise, feeling fit and seeing progress.

One time, where you know I reached up to get a glass, and as I'm bringing it down something clicked in my brain. Where I was like, I'm using my right arm. Like, for the last year and a half I would have been using my left arm, the non-surgical surgery side [...]. And I was like, Oh my God, look at this, look at this, I'm using my right arm [...] I was like [...] intellectually I know that exercise is important, and it makes a difference. And there's results that come from it, but until I saw it myself, that's [...] what had me say, OK I'm going to sign up for the next session. (Female, 46, HC)

3.3.3 Physical Functioning Assessment Findings

The 12-week wave improved in the 2-minute step test over the course of the intervention from 113 ± 17 to 118 ± 17 steps, which was a small effect size increase ($d=0.26$). The HC group drove this change by improving from 111 ± 9 to 119 ± 12 steps by a moderate effect size ($d=0.72$). The change score over time from the HC group ($\Delta\text{Steps}=9$ (9)) was a moderate effect size larger ($g=0.53$) compared to the non-HC group (-3 (28)).

Over the course of the 12-week intervention left ($L_{\text{baseline}}=8.0$ (12.0) cm; $L_{12\text{WK}}=12.0$ (19.5) cm) and right-side ($R_{\text{baseline}}=5.0$ (12.0) cm; $R_{12\text{WK}}=12.5$ (15.0) cm) lower body flexibility improved by a small ($d=0.25$) and moderate effect size ($d=0.55$), respectively. There were no differences between the intervention groups in lower body flexibility. Left upper body flexibility improved from baseline to post intervention by a small effect size. Comparing the change scores to the MCIDs agrees with this finding with the majority maintaining (86.7%) and two participants (1HC; 1non-HC) increasing their left upper body

flexibility. Interestingly when looking at the group median it appears that the HC group improved from baseline (151.0 (6.0)) to post-intervention (162.5 (7.0)) by a large effect size ($d=1.76$). However, on an individual level the change score (-0.5 (18.5)) did not reflect this finding. The latter finding was supported by the MCID with 85.7% of the HC intervention maintaining their left upper body flexibility (Table 11).

3.3.4 Patient Reported Outcomes

In the 12-week wave the QoL score improved from baseline (76 ± 9) to post-intervention (80 ± 8) by a moderate effect size ($d=0.52$). The non-HC group had improved from baseline (76 ± 9) to post-intervention (80 ± 8) by a large effect size ($d=0.93$). This finding was supported by 75.0% of the non-HC group improving by at least one MCID (Table 11). In comparison to the HC group's change score (0 ± 6) the non-HC group's improvement (8 ± 8) was larger by a large effect size ($g=1.04$).

The non-HC group improved in fatigue from pre- (36 ± 10) to post-intervention (39 ± 6) assessment by a small effect size ($d=0.33$). This improvement by the non-HC group (3 ± 8) was a small effect size larger ($g=0.44$) than the change score of the HC group (0 ± 4). However, when comparing the individual change scores to the MCID this finding is not supported. Most participants (80.0%) maintained or improved by at least one MCID, however, there are no clear differences between groups (Table 10). Therefore, the extent of improvement or reduction in certain individuals may have caused the observed differences.

The HC group improved in barrier self-efficacy from baseline (53 (23)) to post-intervention (66 (33)) by a small effect size ($d=0.46$). This improvement by the HC group (4 ± 28) was also a small effect size larger ($d=0.20$) than the change score in the non-HC group (-1 ± 20).

The perceived stress score improved from baseline (16 ± 6) to post-intervention (15 ± 5) by a small effect size ($d=0.24$). The non-HC group improved from baseline (19 ± 4) to

post-intervention (15 ± 6) by a large effect size in their perceived stress score ($d=0.82$). This improvement by the non-HC group (-4 ± 7) was more so than the increase in perceived stress of 2 ± 5 points in the HC group by a large effect size ($g=1.08$). This finding was supported by 50.0% of the non-HC group improving and 42.9% of the HC-group worsening in perceived stress over the course of the 12 weeks. Loneliness worsened over the intervention in both the HC (-1 (1)) and non-HC group (-2 (5)) by an overall small effect size ($d=0.25$). There was no change observed in social support over the 12 weeks. However, the non-HC group's change score (1 ± 2) was a small effect size ($g=0.37$) larger than the HC-group's change score.

Table 7. Baseline to Post-intervention Differences for the non-HC Intervention Group in the 12-week Wave

	Baseline: Mean \pm SD Median (IQR)	12WK Mean \pm SD Median (IQR)	Mean \pm SD / Median (IQR) Difference	95% CI	ES: <i>d</i>
FACT-G	71 \pm 9	79 \pm 8	8 \pm 8	2.68 – 13.32	0.93
FACIT-F	36 \pm 10	39 \pm 6	3 \pm 8	-3.20 – 8.70	0.33
Barrier SE	45 (37)	45 (22)	-1 \pm 20	-21.55 – 21.79	0.00
OSSS-3	11 \pm 2	11 \pm 3	1 \pm 2	-0.69 – 2.19	0.33
PSS	19 \pm 4	15 \pm 6	-4 \pm 7	0.76 – 7.48	0.82
ULS-6	15 (5)	14 (8)	-2 (5)	-3.86 – 5.86	0.15
MVPA (min/week)	250.6 \pm 166.1	219.4 \pm 186.8	-31.3 \pm 180.8	-79.23 – 141.73	0.18
BMI kg/m ²	26.6 (7.7)	26.5 (7.5)	-0.3 \pm 1.1	-4.58 – 4.84	0.02
SROM (R.) (degree)	149.5 \pm 12.0	151.0 \pm 14.0	3.0 \pm 14.5	-6.61 – 10.01	0.13
SROM (L.) (degree)	157.0 (7.0)	157.5 (7.5)	4.0 (6.5)	-3.96 – 4.96	0.07
Steps (reps)	115 \pm 23	116 \pm 20	-2.5 (28.5)	-11.91 – 14.91	0.07
Sit-to-Stand (reps)	15 \pm 2	15 \pm 2	0 \pm 1.5	-1.25 – 1.85	0.13
Reach R. (cm)	2.5 (10.5)	9.5 (19.0)	3.5 (7.5)	-4.15 – 18.35	0.46
Reach L. (cm)	2.5 (13.0)	8.5 (21.0)	2.5 (6.5)	-6.31 – 18.11	0.34
Balance R (sec)	36.5 (30.2)	39.1 (27.4)	0.00 (4.7)	-10.57 – 25.37	0.26
Balance L (sec)	41.1 (28.3)	45.0 (28.1)	0.00 (18.5)	-13.57 – 21.37	0.14

ES=Effect size; Cohen's *d* of 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; Barrier SE = Barrier Self-Efficacy; OSSS-3 = Oslo Social Support Scale; PSS = Perceived Stress Scale; ULS-6 = UCLA Loneliness Scale; MVPA = Moderate to Vigorous Physical Activity; BMI = Body Mass Index; SROM = Shoulder Range of Motion; Reach = Sit and Reach test

Table 8. Baseline to Post-intervention Differences for the HC Intervention Group in the 12-week Wave

	Baseline: Mean \pm SD Median (IQR)	12WK Mean \pm SD Median (IQR)	Mean \pm SD / Median (IQR) Difference	95% CI	ES: d / (g)
FACT-G	81 \pm 7	81 \pm 8	0 \pm 6	-4.66 – 5.52	0.06
FACIT-F	41 \pm 4	41 \pm 4	0 \pm 4	-2.77 – 3.05	0.03
BarrierSE	53 (23)	66 (33)	4 \pm 28	-8.02 – 34.02	0.46
OSSS-3	11 \pm 1	11 \pm 2	0 \pm 2	-0.95 – 1.23	0.09
PSS	13 \pm 6	15 \pm 4	2 \pm 5	-1.71 – 5.71	0.40
ULS-6	15 (6)	16 (7)	-1 (1)	-3.54 – 5.54	0.15
MVPA (min/week)	165.0 \pm 132.9	229.1 \pm 150.8	64.1 \pm 101	-34.27 – 162.55	0.45
BMI kg/m ²	24.5 (4.1)	25.0 (5.1)	-0.1 \pm 0.6	-2.79 – 3.73	0.10
SROM (R.) (degree)	161.0 \pm 10	157.5 \pm 6.5	-1.5 \pm 7.0	-3.16 – 9.76	0.39
SROM (L.) (degree)	151.0 (6.0)	162.5 (7.0)	-0.5 (18.5)	6.96 – 16.04	1.76
Steps (reps)	111 \pm 9	119 \pm 12	9 (9)	0.01 – 15.79	0.72
Sit-to-Stand (reps)	23 \pm 7	24 \pm 7	1 \pm 5	-4.72 – 5.72	(0.07)
Reach R. (cm)	12.0 (8.5)	15.5 (13.0)	3.5 (5.0)	-4.84 – 11.84	0.32
Reach L. (cm)	9.5 (5.5)	14.5 (13.0)	3.0 (5.5)	-4.04 – 14.04	0.50
Balance R (sec)	45.0 (8.7)	45.0 (0.0)	0.0 (8.7)	-8.05 – 8.05	0.00
Balance L (sec)	45.0 (0.0)	45.0 (0.0)	0.0 (0.0)	0.00 – 0.00	0.00

ES=Effect size; Cohen's d of 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; Barrier SE = Barrier Self-Efficacy; OSSS-3 = Oslo Social Support Scale; PSS = Perceived Stress Scale; ULS-6 = UCLA Loneliness Scale; MVPA = Moderate to Vigorous Physical Activity; BMI = Body Mass Index; SROM = Shoulder Range of Motion; Reach = Sit and Reach test

Table 9. Baseline to Post-intervention Differences for the 12-Week Wave

Outcome Measure	Baseline (Mean \pm SD Median (IQR))	12WK (Mean \pm SD Median (IQR))	95% CI	ES: d or (g)
FACT-G	76 \pm 9	80 \pm 8	0.86 – 8.06	0.52
FACIT-F	40 (9)	40 (7)	-3.44 – 3.44	0.00
Barrier SE	52 \pm 21	53 \pm 19	-6.95 – 9.89	0.10
OSSS-3	11 (2)	11 (1)	-4.25 – 4.25	0.00
PSS	16 \pm 6	15 \pm 5	-0.92 – 3.44	0.24
ULS-6	15 \pm 3	14 \pm 4	-0.61 – 2.21	0.25
MVPA (min/week)	210.7 \pm 152.7	223.9 \pm 165.0	-52.22 – 78.74	0.08
BMI kg/m ²	26.7 \pm 5.3	26.5 \pm 5.2	-1.95 – 2.37	0.04
SROM (R.) (degree)	155.0 \pm 12.5	154.0 \pm 11.5	-4.21 – 5.55	0.06
SROM (L.) (degree)	156.0 (10.0)	158.5 (10.5)	-1.71 – 6.71	0.24
Steps (reps)	113 \pm 17	118 \pm 17	-2.47 – 11.39	0.26
Sit-to-Stand (reps)	16 (9)	18 (10)	-2.60 – 5.60	(0.16)
Reach R. (cm)	5.0 (12.0)	12.5 (15.0)	1.75 – 13.25	0.55
Reach L. (cm)	8.0 (12.0)	12.0 (19.5)	-3.53 – 13.59	0.25
Balance R (sec)	45.0 (17.1)	45.0 (7.7)	-7.02 – 7.02	0.00
Balance L (sec)	45.0 (12.1)	45.0 (0.0)	-6.70 – 6.70	0.00

ES=Effect size; Cohen's d / Hedge's g of 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; Barrier SE = Barrier Self-Efficacy; OSSS-3 = Oslo Social Support Scale; PSS = Perceived Stress Scale; ULS-6 = UCLA Loneliness Scale; MVPA = Moderate to Vigorous Physical Activity; BMI = Body Mass Index; SROM = Shoulder Range of Motion; Reach = Sit and Reach test

Table 10. Change Scores of the HC and Non-HC group for both the 8-Week and 12-Week Wave

Outcome Measure	Non-HC: Mean \pm SD Median (IQR)	HC: Mean \pm SD Median (IQR)	95% CI	ES: g
FACT-G	8 \pm 8	0 \pm 6	1.51 - 13.63	1.04
FACIT-F	3 \pm 8	0 \pm 4	-4.53 – 10.31	0.44
Barrier SE	-1 \pm 20	4 \pm 28	-24.80 – 15.30	0.20
OSSS-3	1 \pm 2	0 \pm 2	-0.74 – 1.96	0.37
PSS	-4 \pm 7	2 \pm 5	-10.85 – -1.41	1.08
ULS-6	-2 (5)	-1 (1)	-4.87 – 3.87	0.13
MVPA (min/week)	-31.3 \pm 180.8	64.1 \pm 101	-218.03 – 27.25	0.64
BMI kg/m ²	-0.3 \pm 1.1	-0.1 \pm 0.6	-1.04 – 0.46	0.32
SROM (R.) (degree)	3.0 \pm 14.5	-1.5 \pm 7.0	-5.17 – 13.67	0.37
SROM (L.) (degree)	4.0 (6.5)	-0.5 (18.5)	-10.53 – 19.53	0.33
Steps (reps)	-3 (28)	9 (9)	-35.67 – 12.67	0.53
Sit-to-Stand (reps)	0 \pm 2	1 \pm 5	-3.53 – 4.53	0.15
Reach R. (cm)	3.5 (7.5)	3.5 (5.0)	-7.23 -7.23	0.00
Reach L. (cm)	2.5 (6.5)	3.0 (5.5)	-7.61 – 6.11	0.12
Balance R (sec)	0.0 (4.7)	0.0 (8.7)	-7.64 – 7.64	0.00
Balance L (sec)	0.0 (18.5)	0.0 (0.0)	-15.15 – 15.15	0.00

ES=Effect size; Cohen's d / Hedge's g of 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; Barrier SE = Barrier Self-Efficacy; OSSS-3 = Oslo Social Support Scale; PSS = Perceived Stress Scale; ULS-6 = UCLA Loneliness Scale; MVPA = Moderate to Vigorous Physical Activity; BMI = Body Mass Index; SROM = Shoulder Range of Motion; Reach = Sit and Reach test

Table 11. Percent of Participants Improving, Maintaining, or Worsening by the Minimal Clinically Important Difference for the 12-Week Wave

	Improved		Maintained		Worsen	
	HC <i>n</i> (%)	Non-HC <i>n</i> (%)	HC <i>n</i> (%)	Non-HC <i>n</i> (%)	HC <i>n</i> (%)	Non-HC <i>n</i> (%)
FACT-G	2 (28.6)	6 (75.0)	3 (42.9)	1 (12.5)	2 (28.6)	1 (12.5)
FACIT-F	2 (28.6)	3 (37.5)	4 (57.1)	3 (37.5)	1 (14.3)	2 (25.0)
Balance(R)	0 (0)	0 (0)	7 (100.0)	8 (100.0)	0 (0)	0 (0)
Balance(L)	0 (0)	1 (12.5)	7 (100.0)	7 (87.5)	0 (0)	0 (0)
SROM (R)	0 (0)	0 (0)	7 (100.0)	8 (100.0)	0 (0)	0 (0)
SROM (L)	1 (14.3)	1 (12.5)	6 (85.7)	7 (87.5)	0 (0)	0 (0)
MVPA	5 (71.4)	3 (37.5)	0 (0)	1 (12.5)	2 (28.6)	4 (50.0)
Sit-to-Stand	1 (16.7)	1 (12.5)	4 (66.7)	7 (87.5)	1 (16.7)	0 (0)
PSS	2 (28.6)	4 (50.0)	2 (28.6)	3 (37.5)	3 (42.9)	1 (12.5)

MCIDs: FACT-G = 3 points; FACIT-F = 3 points (McNeely et al., 2020); Balance = 24 seconds (Goldberg et al., 2011); SROM = >10°; MVPA = 26min/week (Hur et al., 2019); Sit-to-Stand = 2.6 repetitions (Wright et al., 2011); PSS-10 = 2.66 points (Drachev et al., 2020)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; PSS = Perceived Stress Scale; MVPA = Moderate to Vigorous Physical Activity; SROM = Shoulder Range of Motion

*Missing Values: Sit-to-Stand = 1 (HC).

3.4 References

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Chapter Four: **Discussion**

4.1 Feasibility Findings

There are well-known benefits of participating in regular exercise for individuals living with cancer, including but not limited to decreased cancer treatment symptom burden (Canadian Cancer Statistics Advisory Committee, 2019; Clifford et al., 2018; Courneya et al., 2012; Husebø et al., 2013; Jackson et al., 2018; Joly et al., 2019), decreased chances of cancer recurrence, as well as decreased cancer-specific and all-cause mortality (Cormie et al., 2017). However, despite this growing evidence, the majority of cancer survivors are not sufficiently active or are unable to maintain being active (Grimmett et al., 2019; Ottenbacher et al., 2012). Delivering synchronous online exercise maintenance programming offers a delivery option that may reduce common barriers to physical activity (PA) for cancer survivors, including lack of time and proximity or accessibility to cancer specific exercise centers (Jackson et al., 2018). However, adherence rates in an online setting are usually low (Brown et al., 2012; Persoon et al., 2013; Zhou et al., 2016), therefore, additional support, such as in the form of health coaching (HC), may be needed.

The exercise oncology literature investigating either synchronous online delivered exercise classes or HC is scarce to date, and no consensus on protocols for such interventions exists. Therefore, the purpose of this study was to test the feasibility of an online synchronously delivered exercise program, supported with HC. Feasibility, including recruitment rate, safety and attrition, fidelity of the intervention components (HC and online delivered exercise classes), and completion rates of the delivered interventions (HC and online delivered exercise classes) and the tools used to measure the effects of the interventions, was assessed.

All measures of fidelity met or exceeded the pre-set criteria (see results, chapter 3, for further details). The recruitment rate of this online study (42.6%) was similar to the ACE

recruitment rate for in-person maintenance programming of 41.3% over the last five years. Thus, recruitment into an online exercise maintenance program is comparable to the recruitment for an in-person delivered exercise maintenance program. Other studies that were focused on the remote delivery of exercise supported with HC had recruitment rates ranging from 35.9% (Hawkes et al., 2013) to 70.2% (Gell et al., 2020).

In the current study, the online delivery of the exercise maintenance program was feasible, as indicated by completion rate of the classes (91.2%), completion of the post-class sessions (88.4%), and intervention fidelity (92.6%), all exceeding the predetermined feasibility cut-offs of 70%. Little prior research has examined the online delivery of a synchronous supervised exercise program. Work by Tomlinson et al. (2020) with patients that have cystic fibrosis, reported that online delivered exercise is feasible. In this study, participants attendance to the one-on-one training sessions over Skype with an exercise therapist was high (67.0%). As hypothesized, the HC intervention group had higher class and post-class attendance rates compared to the non-HC group. Similar to the findings in Tomlinson et al. (2020), technical interruptions for the online platform were the largest reason for deviation from the exercise intervention delivery protocol. However, Tomlinson et al. (2020) reported 25.0% of the sessions experiencing technical difficulties, compared to the 4.4% of classes experiencing technical interruptions in this pilot study. This may speak to the improvements in technological advancements and thus the growing potential for synchronous delivery of online exercise programs (Culos-Reed et al., 2021). Additionally, the intervention was safe, based on both participants perception and no adverse events occurring during the exercise classes.

To the best of our knowledge, this is the first study examining the synchronous delivery of online group-based exercise for cancer survivors. As Bland et al. (2020) noted, delivering

synchronous exercise classes to cancer survivors is an important gap to be addressed, protecting an often immunocompromised population while still allowing them access to resources to help improve their health and wellness. This is even more essential during the COVID-19 pandemic, where health risks are heightened for those undergoing or recently completed cancer treatment (Al-Shamsi et al., 2020). The convenience of home and the reduced exposure for individuals living with cancer, in addition to reduced visual concerns due to changes in body shape or chemotherapy-related side effects, were also mentioned as facilitators to engaging in online exercise. The most frequently mentioned factor contributing to convenience for the home-based online programming was travel time, which was also found by Tomlinson et al. (2020). Eliminating the travel time to and from exercise facilities reduces two of the main barriers to PA, lack of time and proximity to exercise facilities (Jackson et al., 2018).

Similar to the majority of previous studies on HC in exercise oncology (Gell et al., 2017; Gell et al., 2020; Hawkes et al., 2013; Samdal et al., 2017), the current HC intervention was feasible, with a completion rate of 97.0% and an intervention fidelity of 96.7%, exceeding the predefined cut-offs of 80.0%. The mean HC call length (34.2 ± 13.2 min) aligns with a recent study in cancer survivors that recorded a median call length of 31.5min (Hawkes et al., 2013). Other studies in exercise oncology that did not include the educational component (defined as one of the key pillars of HC by Wolever et al. (2013) generally reported shorter durations of the calls (Lion et al., 2020; Pinto et al., 2015). In a systematic review of HC in general, Wolever et al. (2013) reported a mean call length of 35.8min. Duration of the HC call has both pragmatic and economic implications for sustainable implementation (Panagioti et al., 2018), therefore based on the current evidence, aiming for a 30-minute call length seems appropriate.

The coach-participant relationship, accountability, and the tailored educational components were highlighted as important facilitators to PA and well-being in the participant interviews. It is important to note that these components are part of Wolever et al.'s definition of HC, indicating the HC intervention was not only delivered as intended, but also received by the participants as intended within the protocol.

Finally, completion rates of the physical functioning assessments (97.5%), the objective PA measurement (83.4%), and the questionnaires (98.8%) were high and exceeded the feasibility threshold of 70.0%. Participants' interview feedback supported that the assessments were feasible and their interest in results was a key motivator to participate in the assessments. There are two important pieces of information to consider for the Garmin activity tracker wear time. First, the trend of having lower wear time in the first week of tracking can be explained through the time it took to understand and set-up the Garmin Vivosmart4. Not having sufficient information regarding the Garmin activity tracker was a key concern raised during the interviews. In addition to the lower wear time in the first week, two participants accidentally signed up with their personal email address instead of the provided study account, and another participant was unsure of their responsibilities with the tracker. These issues either resulted in lower wear time or the inability to access the collected data. Second, the lower wear time during the last week of the program can be potentially attributed to not synchronizing the tracker one last time before sending it back to the research team. Interestingly, a similar trend was observed by Gell et al. (2020), in which the wear time of the Fitbit reduced in the final week of the intervention. Thus, it is important for logistics (delivery to participants, with set-up support) to be addressed prior to the first week of tracking of data, and reminders and support for obtaining the last week of data, to be worked into study protocols that utilize a wearable activity tracker.

In accordance with the pragmatic philosophy of this pilot study, the following actionable items should be considered for future research as well as for exercise maintenance program implementation. First, participants had a clear preference for two structured exercise maintenance classes per week. This aligns with the ACSM PA guidelines for cancer survivors, which recommend moderate-intensity aerobic training in combination with resistance training at least two times a week (Campbell et al., 2019). Therefore, having structured mixed modality exercise classes twice a week supports cancer survivors in meeting the guidelines of 90 minutes of MVPA per week, while providing the flexibility to also be active in additional unstructured settings, based on their preferences.

Second, measurement issues must be considered for furthering our knowledge around how to support and measure outcomes associated with exercise maintenance. Specifically, ensuring PROs are relevant to where participants are in their cancer journey so that participants feel understood when answering the questions, is critical. For example, some of the symptom-related patient reported outcomes (FACT-G or FACIT-F) items may not be applicable to those in longer term survivorship phases (e.g., nausea), and thus may be seen as frustrating to answer for some participants. Future research should consider adding in a “Not Applicable” answer option to each question, and/or providing the opportunity to add in qualitative comments for the chosen answers, if applicable.

Third, to enhance usability of a commercially available PA tracker, clear instructions must be provided for participants. While the participants did receive a set-up and expectations protocol with the tracker, this instruction may have not been sufficient. Thus, future work will utilize a tutorial video (Appendix J) guiding them through the PA tracker processes. An additional compliance strategy stated by Trost et al. (2005) is to provide a ‘frequently asked

questions' list. Over the course of this study, there were common questions raised, therefore providing frequently asked questions and answers to future participants at the start of a program may proactively address potential issues and thereby increase adherence to wearing and synchronizing the tracker appropriately. To address the missing data in the last week of the program, reminders must be sent out to ensure participants synchronize the tracker before sending back to the research team.

Finally, participants were interested in seeing their results, therefore providing them with a results summary may lead to higher completion rate of the assessments. These areas of improvement with the respective actionable items are summarized in Table 12.

Table 12. Pragmatic Adjustment Recommendations

Area of improvement	Pragmatic Adjustments
Online Delivered Exercise Classes:	1) Offering ≥ 2 classes per week
Questionnaires:	1) Add in comment box 2) Add in NA option
Commercially available activity tracker:	1) Clear Instruction (potentially through different forms of providing information) 2) Frequent asked question list 3) Reminders about end of program procedures
Physical Functioning Assessments:	1) Providing a meaningful summary of results

4.2 Exploratory Findings

For the exploratory analysis, the two waves were not combined due to differences in physical fitness at baseline assessment. These differences may have occurred due to the different time frames each intervention was held in. Specifically, the first wave started in May 2020, two months after the WHO declared COVID-19 a worldwide pandemic (WHO Director-General, 2020). At this time, online delivered PA resources and adaptations to living during physical distancing measures were still scarce. Therefore, participants had reduced opportunities to stay

active in the time before study commencement compared to the participants starting in the Fall, who had recently completed a 12-week ACE baseline program (ACE online programming was offered up until August 29th, 2020, two weeks before study commencement). Fall participants may have also had other opportunities to stay active in a COVID-adjusted world throughout the summer, when less restrictions were in place.

As suggested by Amireault et al. (2015) the modified Godin Leisure Time Exercise Questionnaire (mGLTEQ) was used in conjunction with an objective measure of PA (Garmin Vivosmart4). No evidence of a correlation ($r=0.06$; $p=0.748$) was found between the two measurements of MVPA minutes, similar to Amireault et al. (2015). Due to the nature of Garmin's non-transparent proprietary algorithms, the recommendation of Fuller et al. (2020) was followed and an algorithm based on previous activity tracker procedures was written to calculate MVPA minutes (see Chapter 5). This imputed algorithm had a statistically significant correlation ($r=0.59$; $p<0.001$) with Garmin's proprietary algorithm (described in Chapter 5.). The reported Garmin MVPA minutes/week were frequently zero, which supports the need to code a transparent algorithm. The current version of the algorithm designed by the research team likely overestimates MVPA min/week and should therefore only be interpreted in terms of relative trends.

Despite this being a pilot study, which was not powered to detect meaningful differences, there were some interesting preliminary findings that may help inform a future fully powered study. Self-reported MVPA minutes increased in both waves of the study, and more so for the HC group than in the non-HC group. The HC group's increase in MVPA minutes per week, of 38.9% in the 12-week wave, was similar to the findings of Ristevsk et al. (2020), who found that the HC group increased their MVPA levels by 35.0%. In addition to being more physically

active, participants of the HC group also improved their cardiovascular fitness ($d_{12WK}=0.72$) more so than the non-HC group ($d_{12WK}=0.07$).

The percentage of participants meeting exercise guidelines according to the GarminVivosmart4 were low in the 12-week wave (30.3%). An interesting finding was that a higher percentage of participants in the HC group (MVPA90_{HC}=38.3%) met the exercise guidelines across the recorded weeks compared to the non-HC group (MVPA90_{non-HC}=17.6%). However, this finding should be interpreted with caution. Because unless the HC intervention had an immediate impact on the MPVA minutes after the first week, the HC group started at a higher activity level than the non-HC group. The differing baseline activity levels are however not supported by the steps per day in the first week or the self-reported MVPA min/week at baseline, for which both the non-HC group reported being more active. Therefore, no statement about the effectiveness of HC in helping cancer survivors maintain being physically active in terms of meeting cancer specific exercise guidelines can be made. However, Hawkes et al. (2013) found that HC facilitated meeting PA recommendations (recommendations were 150 minutes of MVPA per week) compared to the non-HC group. This promising preliminary finding agrees with Gell et al. (2020) finding on HC's impact on MVPA maintenance, and therefore further research with refined objective measurement tools and analysis are needed to test the impact of HC interventions.

Using steps to assess general PA levels is a common practice in exercise oncology. The average daily step counts at the end of program were similar to those in an online walking intervention in cancer survivors, which reported 8387 ± 3543 steps/day (Frensham et al., 2018). The HC group decreased their step count from week 1 to week 12 by a moderate effect size ($g=0.50$), whereas the non-HC group increased their mean daily step count by a small effect size

($g=0.29$). Overall, trends between the different measures of PA (objective MVPA, subjective MVPA, and steps) varied in this study. Therefore, future research has to critically evaluate which metric and measurement tools should be used to evaluate general physical activity. For an exercise study, we recommend MVPA minutes per week, which is a more holistic measure than steps.

Exercise has been previously shown to aid cancer survivors to maintain or even increase their level of physical functioning (Buffart et al., 2017; Swartz et al., 2017). In the current study, we found some evidence that lower body flexibility has the potential to continually improve in the maintenance phase. Other metrics of physical functioning, including upper body flexibility, cardiovascular fitness, strength endurance, and balance were maintained throughout the intervention. Additionally, participants of the HC group improved their cardiovascular fitness ($d=0.72$) more so than the non-HC group ($d=0.07$). It should be noted that there is limited evidence on objectively measured physical functioning in cancer survivors after an exercise intervention to compare these findings to. Most studies to date have relied on the subjective reporting of physical functioning (Campbell et al., 2019). Therefore, further validation studies are needed of previously established objective physical functioning tests for use specifically in an online environment. Once validated, these tools will enable us to best assess the impact an online exercise oncology intervention has on physical functioning.

Thus far, there is no evidence in the oncology literature that supports that HC increases self-efficacy (Barakat et al., 2018). However, studies with other chronic disease populations provide strong evidence that HC does improve self-efficacy (Dennis et al., 2013). In the current study, the HC group increased their barrier self-efficacy for PA by a small effect size ($d=0.46$), with no such improvement seen in the non-HC group. During the semi-structured interviews,

participants also talked about their plans to continue a physically active lifestyle, which they mainly attributed to their self-efficacy to exercise and the resources provided to them. Self-efficacy and behavioural intention are well-identified facilitators of PA exercise maintenance (Amireault et al., 2013; Kampshoff et al., 2014). Therefore, future work must continue to understand and support the connection between HC and various forms of self-efficacy, which are critical in building PA maintenance in those living with cancer.

Quality of life (QoL) improved from baseline to post intervention by a moderate effect size ($d=0.52$). This finding aligns with previous studies which show strong evidence on the impact of supervised exercise programming on QoL (Sweegers et al., 2018). Both QoL and fatigue had larger effect size increases in the non-HC group compared to the HC group. Overall, there is limited evidence on the impact of HC interventions on QoL and fatigue, or other symptom management, in exercise oncology populations (Barakat et al., 2018). Given the known determinants from treatment-related side effects on these outcomes, and the overall goal to use exercise to enhance QoL, the potential role for HC to further support improvements should be considered in future work.

Finally, the measures that were intended to test the interventions impact on coping with COVID-19 related physical distancing measures including stress, loneliness, and social support, had mixed findings. The uncertainty caused by the COVID-19 pandemic has dramatically increased the distress felt by cancer survivors (Al-Shamsi et al., 2020). Therefore, the finding of reduced stress by a small effect size ($d=0.24$) is especially promising. This finding is supported by previous research on the impact of exercise in reducing stress (Jackson, 2013). Loneliness worsened during the 12-week wave by a small effect size ($d=0.25$) and social support was maintained. Overall, it can be seen as a positive finding that neither of the measures drastically

worsened during COVID-19 physical distancing measures, as has been reported with other cancer survivors (Al-Shamsi et al., 2020; Lou et al., 2020).

4.3 Strengths and Limitations

A strength of this study is the design of the HC intervention, which incorporated several behaviour change techniques noted to support PA maintenance in cancer survivors (Grimmett et al., 2019). The combination of assessing MVPA objectively throughout the intervention, and pre/post subjectively, may contribute to a better understanding of the intervention impact on PA levels (Amireault et al., 2015). The mixed methods design is another strength of the study, with the qualitative information collected via interviews providing further insight on the protocol's feasibility, as well as the outcomes. Finally, the randomized design within each wave, with blinded physical functioning assessors, is a strength of the study. RCT's are the highest level of evidence in intervention science. The randomization allowed for an unbiased intervention allocation and therefore a heterogeneous sample of the population can be expected. Blinding the physical functioning assessors reduced the risk of measurement bias.

Even given these strengths, this pilot study also has some limitations. The study was retrospectively registered due to the immediate timeline for implementation that was necessitated during COVID-19 lockdown measures. The eligibility criteria, that participants had to have completed an ACE baseline class, limited the sample pool to draw from. The convenience sampling also potentially introduced a bias, as participants who signed up for a maintenance study are more likely to be motivated for PA. Additionally, ethnicities were representative of the Canadian population except for Indigenous people who were underrepresented, with only 2.5% compared to the population wide 6.2 % (Statistics Canada, 2017). Therefore, findings may not be generalizable to cancer survivors at large. A potential threat to the internal validity was the activity tracker's range of behaviour change gadgets, which participants may have accessed and

thus could have impacted their behaviour change. To help document this potential confounder, the research team inquired about the general usage of the activity tracker during the semi-structured interviews and post-study questionnaire. Finally, the researcher was actively involved in the intervention through the role of the exercise class moderator and as the health coach. Therefore, when conducting the semi-structured interviews, participants may have been more inclined to give positive feedback. However, this may also be seen as a strength, since familiarity and rapport with the participants and familiarity with the program may have helped participants feel more comfortable, and therefore resulted in more detailed feedback.

4.4 Conclusion

This study is the first in exercise oncology to show that the synchronous delivery of online group-based exercise classes, and a supporting HC intervention tailored for cancer survivors, are feasible. Given the potential of these interventions and the importance of targeting PA maintenance to enhance well-being in those living with cancer, further research on testing the efficacy of such programing is needed.

4.5 References

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Chapter Five: **Conclusion & Future Directions**

The purpose of this chapter is to highlight areas in the exercise oncology literature that require further exploration to support physical activity (PA) maintenance in cancer survivors. Specifically, the areas of consideration include the synchronous delivery of online exercise classes, the delivery of health coaching (HC) interventions, and the objective measurement of moderate to vigorous physical activity (MVPA) minutes with commercially available activity trackers. The following provides directions and key considerations for future research on supporting cancer survivors to maintain a habit of PA.

5.1 Synchronous online delivery

Providing online programming to cancer survivors is especially important during the COVID-19 pandemic. The pandemic and associated physical distancing measures have caused greater family distress and concern of getting infected for cancer survivors compared to the general public (Lou et al., 2020). The pandemic has not only disproportionally influenced the psychological well-being of cancer survivors, but also the physical well-being. Cancer treatments, including delayed chemotherapies, have been negatively impacted (Lou et al., 2020). Additionally, preliminary findings suggest cancer survivors could be twice as likely to be infected by SARS-CoV-2 and have a higher morbidity and mortality if infected (Al-Shamsi et al., 2020).

Telehealth, defined as the remote delivery of care, is a growing field (Wosik et al., 2020). By making the need for remote delivery of programming a necessity, the COVID-19 pandemic has accelerated the implementation of telehealth programming (Wosik et al., 2020). Additionally, the technological advancements have opened new avenues to provide telehealth, or virtual care,

in a safe and efficient way (Ahmad et al., 2021). Therefore, online programming offers the potential to deliver equitable care to a larger part of the population.

While this growing area of research is promising, there is currently limited evidence on the synchronous online delivery of exercise programming. One study for patients with chronic pulmonary disease delivered a synchronous exercise program and found it to be safe and feasible (Holland et al., 2013). Another study for individuals with cystic fibrosis provided exercise over a videoconferencing platform (Skype) and concluded this platform to be feasible for synchronous delivery (Tomlinson et al., 2020). Both studies reiterated the importance of having sufficient infrastructure (i.e., technology) in place to provide telehealth care that can be as undisrupted as possible. To the best of our knowledge, no published work to date has examined synchronous online delivered group-based exercise programs for cancer survivors (Bland et al., 2020). Our ongoing trials for ACE (McNeely et al., 2020) and EXCEL (NCT04478851) are currently delivering online group-based synchronous exercise oncology programs. A currently registered trial at the Rutgers Cancer Institute of New Jersey has started recruitment for a feasibility study of a 12-week long synchronous delivered exercise program (NCT04562233). Thus, this pilot feasibility study is the first to report on the safety, fidelity, and adherence considerations for delivering synchronous group-based exercise classes to cancer survivors.

While the online delivery of programming for cancer survivors was especially important during the COVID-19 pandemic, providing such support to cancer survivors will also be critical post-pandemic. Synchronous delivered group-based exercise programming may provide both the benefits of supervised group-based programs, including higher adherence, social support, and high-quality instruction, while at the same time reducing the barriers of accessibility to facilities and travel time (Granger et al., 2018; Nock et al., 2015; Wilson et al., 2006). This may be

especially applicable for cancer survivors living in rural or remote locations, undergoing immunocompromising therapies, or returning to work and parental responsibilities. Other cancer survivors may simply prefer to exercise from the comfort of their home (Jackson et al., 2018; Nock et al., 2015). Therefore, continuing the efforts of improving the online delivery of exercise programming and testing the efficacy of such programming will reduce barriers and make exercise programming available to a broader audience of cancer survivors. As mentioned above, one of the research programs doing so already is Project EXCEL: EXercise for Cancer to Enhance Living Well. EXCEL is a CIHR-Canadian Cancer Society funded and Alberta Cancer Foundation supported, Canada wide study (NCT04478851) that offers 12-week exercise classes via an online format. Targeting rural and remote cancer survivors, EXCEL aims to reduce the disparities that exist in access to exercise as a supportive cancer care resource, while providing physical, functional, and psychosocial benefits to participants. Results from this work, and the upcoming completion of ACE, will be disseminated beginning in Fall 2021.

5.2 Health Coaching

HC is participant-centred, built on a coach-participant relationship, and includes participant-determined goals, a self-discovery process to find solutions, patient accountability, and education (Wolever et al., 2013). HC may be a useful tool to support exercise adherence and maintenance in those living with cancer. Most studies to date in cancer survivors have focused on HC for pain control, with only 6 studies (Gell et al., 2017; Gell et al., 2020; Hawkes et al., 2013; Pinto et al., 2015; Ristevsk et al., 2020; Yun et al., 2020) specifically targeting the use of HC to support increases in PA or exercise behaviour change for individuals living with cancer. These few studies done in exercise oncology report inconsistent findings for feasibility and efficacy (see Chapter 1). Issues include inconsistent reporting of HC protocols, including the terminology used; the transparency of reporting; the training of the HC providers; and fidelity of

the HC protocol implementation. In a literature search, we identified 24 studies who met at least one of the six HC criteria (Wolever et al., 2013) without necessarily calling the intervention HC.

5.2.1 Terminology

Interventions meeting the HC criteria (Wolever et al., 2013) may alternatively be called telephone counseling (Djuric et al., 2011), telephone-delivered exercise (Eakin et al., 2012), motivational interviewing (Campbell et al., 2009; Lion et al., 2020), or coaching (Pinto et al., 2015). Telephone counseling has been most frequently reported in the literature to date (Demark-Wahnefried et al., 2006; Djuric et al., 2011; Donnelly et al., 2011; Matthews et al., 2007; Morey et al., 2009; Pinto, Papandonatos, & Goldstein, 2013), however, this term encompasses a wide range of interventions that incorporate all components of HC (Djuric et al., 2011), to only the PA accountability portion of HC (Matthews et al., 2007). The interventions only incorporating the latter are sometimes also referred to as standardized phone calls (Mayo et al., 2014), activity counseling (Pinto et al., 2005; Pinto, Papandonatos, Goldstein, et al., 2013; Pinto et al., 2008), client-centered counseling (Campbell et al., 2009), or fitness consultation (Courneya et al., 2003). Using inconsistent and overlapping terminology makes it difficult to decipher which interventions are actually being provided to the participants, and if they should be considered in reviews of HC to assess the usefulness of this modality or approach? to support exercise and PA maintenance. Future work must use clearly defined terminology when describing the implemented intervention. For example, standardized reporting could be to state which of Wolever et al.'s 6 criteria (participant centered, participant determined goals, self-discovery process to find solutions, accountability, education, and coach participant relationship) were used in the intervention.

5.2.2 HC Dose Reporting

To date, few studies have reported on the length and frequency of the provided HC intervention. Out of the previous 24 mentioned studies only 12 (Djuric et al., 2011; Donnelly et al., 2011; Eakin et al., 2012; Hawkes et al., 2013; Ligibel et al., 2012; Lion et al., 2020; Matthews et al., 2007; Pinto et al., 2005; Pinto, Papandonatos, & Goldstein, 2013; Pinto, Papandonatos, Goldstein, et al., 2013; Pinto et al., 2015; Yun et al., 2020) reported on the frequency of HC calls and only 8 (Donnelly et al., 2011; Hawkes et al., 2013; Lion et al., 2020; Matthews et al., 2007; Pinto et al., 2005; Pinto, Papandonatos, & Goldstein, 2013; Pinto, Papandonatos, Goldstein, et al., 2013; Pinto et al., 2015) on both frequency and duration of the HC calls. Reporting the HC dose as standard practice is important for two reasons. First, this will help establish an ideal dose required to impact exercise behaviour change within HC protocols. Second, for HC to move into implementation science, it has to not only be effective, but also economically feasible. Therefore, reporting the minimal dose of HC required to yield efficacy will add to the preliminary evidence of HC's economical effectiveness (Demark-Wahnefried et al., 2015; Panagioti et al., 2018). Future research must set an emphasis on reporting both the duration and frequencies of calls to better understand which dose may be feasible and effective for HC interventions.

5.2.3 Health Coach Training

Reporting details about the training and professional background of the health coach must be encouraged within the exercise oncology literature. Only 7 (Campbell et al., 2009; Hawkes et al., 2013; Ligibel et al., 2012; Lion et al., 2020; Pinto, Papandonatos, Goldstein, et al., 2013; Pinto et al., 2015; Yun et al., 2020) of the 24 studies reported on the amount and content of training the coach received before delivery. This training varied from 8 hours (Pinto et al., 2015) to 3 months (Yun et al., 2020) of training. Eleven studies reported on the profession of the

individual delivering the call, which included dietitians (Djuric et al., 2002; Djuric et al., 2011), qualified exercise professionals (Eakin et al., 2012), research staff (Campbell et al., 2009; Lion et al., 2020; Pinto, Papandonatos, Goldstein, et al., 2013; Yun et al., 2020), behavioural counselors (Ligibel et al., 2012), nurses (Griffith et al., 2009), psychology and health promotion majors (Hawkes et al., 2013), and peer coaches (Pinto et al., 2015). The training of the health coach may influence the quality of the provided HC intervention, and has sustainability and economic implications. Therefore, future studies in exercise oncology must report the level and content of training as well as the profession of the individual delivering the HC intervention. This will further the understanding of the extent of training requirements needed to provide quality care in supporting cancer survivors to be physically active.

5.2.4 Fidelity Reporting of the HC Protocol

Finally, the feasibility and acceptability of the few studies performed in exercise oncology varies from low (Yun et al., 2020) to high feasibility (Gell et al., 2017; Gell et al., 2020; Hawkes et al., 2013). Besides completion, recruitment, and attrition rates, a critical aspect of feasibility is to include documentation of the fidelity of the protocol used. From the 24 studies, only 4 (Campbell et al., 2009; Djuric et al., 2011; Hawkes et al., 2013; Pinto, Papandonatos, & Goldstein, 2013) reported on the fidelity of the applied protocol. It is critical to transparently report on the fidelity of the defined protocol to better understand what was actually provided as an element of feasibility. Due to the focus of HC being a participant-driven and tailored approach, it may be difficult to have a generalized fidelity check list that applies to all situations. However, an attempt to quantify the delivered intervention may include using the 6 criteria provided by Wolever et al. (2013) or using the motivational interviewing treatment integrity coding scheme (Moyers et al., 2005). Transparently reporting on the feasibility of the HC

protocol used will advance the exercise oncology literature and allow feasible HC interventions to be tested for efficacy in future fully powered studies.

Future HC research in exercise oncology must continue to examine HC efficacy for supporting long term PA behaviour change. A potential study design would be a sequential multiple assignment randomized trial (SMART). In this SMART trial, multiple behaviour change tools, including HC and the availability of continued programming support, could be tested in a sequential manner, with adaptations made at set points for those experiencing success (i.e., PA maintainers) vs those struggling (i.e., PA non-maintainers). A tailored delivery of resources to participants, optimizing the efficacy of such interventions based on participant response, will result in more impactful and sustainable programming support, tailored to the needs of cancer survivors.

5.3 Commercially Available Activity Trackers

5.3.1 Objective MVPA measurement

Objectivity is one of the key tenants of the scientific method, therefore, finding viable ways to objectively assess PA is of growing interest in exercise oncology. Commercially available activity trackers are becoming increasingly popular among the public and a preference exists towards wrist worn wearables (Alley et al., 2016). This growing public interest, in combination with the user-friendliness, the price, the reduced invasiveness, and the wide variety in functionality, make activity trackers a viable alternative to research grade accelerometers, the standard for objective PA measurement (Henriksen et al., 2018). Additionally, research grade accelerometers are usually used for pre- and post-measurements, whereas, due to their user-friendliness and reduced invasiveness, activity trackers can be used as a continuous measure of PA throughout the intervention. To date the most frequently used commercially available activity trackers in the literature are from Fitbit, Garmin, or Apple (Fuller et al., 2020).

A problem with using commercially available activity trackers is that the majority of these devices are not formally validated. A review on commercially available wearables found that less than half of the devices and only 5% of the technologies used had been formally validated (Peake et al., 2018). This is perhaps not surprising, since the fast-paced landscape of commercially available activity trackers makes it difficult for validation studies across models. Brands like Fitbit and Garmin almost release yearly updated versions of the same model. Additionally, algorithms can change frequently with any new software update. This is especially problematic, since the algorithms are proprietary and can be changed at any time by the industry team, leaving researchers unaware of the algorithm used to determine the metrics and the time point it was changed (Fuller et al., 2020). An additional problem of using commercially available activity trackers as an objective measure of PA is the potential biases they introduce. The Garmin Vivosmart2 (a previous version of the model used in this pilot study) was found to incorporate a total of 19 behaviour change techniques to enhance PA levels, and 10 to reduce sedentary behaviours (Duncan et al., 2017). This volume of support makes it difficult to use these trackers solely as measures of objective PA, and therefore the effect of the tracker on behaviour change should be considered.

In this pilot study we aimed to follow best practice by acquiring the data from Garmin's Health API, developing our own algorithm to determine MVPA minutes, and making this algorithm publicly available on the open science framework (Fuller et al., 2020). Our initial plan was to incorporate HR and accelerometry data into the algorithm, however, Garmin only makes accelerometry data of the recorded activities available. Therefore, accelerometry could not be included in the calculation of overall MVPA minutes per week, and this metric had to be derived solely from HR data. To calculate MVPA from HR there are several things to consider, including

the metric to base HR off, the extent of smoothening of the data, the cut-offs for intensity domains of the chosen metric, and the time that has to be spent over a certain intensity threshold.

A wide range exists in the exercise literature on how to derive MVPA from HR including absolute measures like a generic HR cut-off (eg 140bpm) (McManus et al., 2008) or relative metrics like %HR_{max} and percent HR reserve (%HRR) (Gil-Rey et al., 2014). Since HR is largely age dependent, using a generic cut off for all age groups of individuals is not recommended. When choosing to use %HR_{max}, a key consideration is how to determine HR_{max}. The gold standard to measure HR_{max} is with an electrocardiogram during a stress test, however, this is often not feasible due to the equipment needed and the physiological stress imposed on participants (Sarzynski et al., 2013). Therefore, the prediction formulas HR_{max}=220-age (Fox 3rd & Haskell, 1968) or HR_{max}=208 – 0.7*age (Tanaka et al., 2001) are commonly used. Both of these methods of predicting HR_{max} are accurate in predicting the mean of a group, however, have discrepancies with both the lower and higher HR_{max} extremes. The Tanaka et al. formula⁴⁶ was specifically designed to be more accurate in older adults and was found to have slightly lower standard error of estimate values compared to the Fox et al. method (Sarzynski et al., 2013). Therefore, the HR_{max}=208 – 0.7*age formula was incorporated in the algorithm to predict MVPA from %HR_{max} in the present study.

Another area of discrepancy in calculating MVPA from HR is whether the data is smoothed or not. Smoothing the data is when the moving average over a certain time epoch is taken instead of every single data point. This process allows for single spikes of the HR, which are commonly due to a measurement error, not impacting the calculation of MVPA minutes. Implementing smoothening epochs of 60 seconds has been done previously in the exercise oncology literature with accelerometer data (Hartman et al., 2018; Maxwell-Smith et al., 2019)

and is recommended practice when using devices with Photoplethysmography technology (Allen, 2007). Thus, the designed algorithm in the current study included 60 second smoothening epochs.

Another key consideration is to determine which HR cut-offs to use for moderate and vigorous intensity domains. According to the general ACSM guidelines, moderate and vigorous intensity domains are defined as 64-76% and 77-95% of HR_{max} , respectively (Liguori & Medicine, 2020). However, according to Gil-Rey et al. (2014), lower domains should be considered for cancer survivors where moderate intensity is defined as 55-70% of HR_{max} (Gil-Rey et al., 2014). In the current algorithm, we incorporated the cancer specific cut-offs of 55% HR_{max} and 71% HR_{max} for moderate and vigorous intensity, respectively.

A final consideration is the amount of time that has to be spent in a certain intensity domain for it to be counted as MVPA minutes. The oncology literature is quite inconsistent in this criterion, with some recommending that every minute of PA should count, whereas others having cut-offs of 5 (Gell et al., 2017), 10 (Maxwell-Smith et al., 2019), or 15 consecutive minutes over the pre-defined threshold. This may contribute to discrepancies in the findings reported in the literature, since with larger thresholds shorter bouts of activity may not be counted. In this pilot work, we used a 10-minute cut-off in order to be able to compare it to the Garmin derived MVPA data, which uses the same cut-off (Garmin Ltd., 2021).

After writing the algorithm accordingly, the reported MVPA levels had a large variability between participants and were extremely high for some participants (See Chapter 3). One of the reasons could be that the tracker itself records higher HR values than usual. However, this seems unlikely, with previously validated Garmin models being under the top performers in measuring HR compared to other commercially available trackers (Fuller et al., 2020; Tedesco et al., 2019).

Additionally, if discrepancies were found, Garmins generally underestimated HR rather than overestimating (Fuller et al., 2020). Two more plausible explanations are HR variability, the age predicted HR_{max} , and the associated $\%HR_{max}$ thresholds. The effects of chemotherapy on autonomous HR regulations and resulting increased HR variability may explain some of the inter and intra-participant variance (Broderick et al., 2014). Additionally, the predicted HR_{max} may not be applicable to each participant and a variance can be expected especially with very young or old participants (Sarzynski et al., 2013). This would cause the intensity thresholds to either be too high and result in underestimating MVPA, or too low and overestimating MVPA. Finally, choosing the correct percentage of HR_{max} corresponding to the moderate or vigorous intensity domain is of critical importance. We compared Gil-Rey et al.'s (2014) cut-offs of 55-70% (moderate intensity) to the ACSM thresholds of 64-76% (moderate intensity), and a similar trend of large variabilities and extremely high MVPA values occurred. Therefore, we believe the problem with the current algorithm is more individualized than the applied $\%HR$ thresholds.

Future investigations that aim to quantify PA minutes with a commercially available PA tracker should aim to acquire their data through an API, apply their own algorithms to determine MVPA, and make these algorithms publicly available (Fuller et al., 2020). Garmin and other private companies on the other hand should strive to make API data easily available for researchers that are interested in using their devices in implementation science. If HR data is the only metric available, future studies should consider using $\%HRR$ to estimate intensity levels. $\%HRR$ acknowledges the resting HR of an individual and is therefore more tailored to individual differences. Gil-Rey et al. (2014) recommend defining moderate intensity as 23 to 48% of HRR. Applying these cut-offs may lead to less variability between participants and an overall more realistic estimation of MVPA minutes.

5.3.2 *Wear time tracking*

Tracking the wear time of an activity tracker is important to understand its feasibility as an objective measure of PA, as well as helps further elucidate the MVPA data at hand. For example, if the estimated sum of MVPA minutes during a certain week is low, this may simply be due to reduced wear time and not actual reduced PA. A valid day of wear time is commonly defined as 10h in the exercise oncology literature (Frensham et al., 2018; Gell et al., 2017; Hartman et al., 2018; Kenfield et al., 2019). It is advised to calculate wear time from HR data instead of accelerometer data (Broderick et al., 2014). When an activity tracker is moved while not being worn it may detect an accelerometry signal, whereas a HR sensor would detect no signal. If only accelerometer data is available, a more conservative wear time cut-off of 12h may be advised.

Another important consideration is the number of valid wear time days needed to estimate MVPA minutes. Trost et al. (2005) recommended a minimum of 3-5 valid days of wear time as necessary. Since MVPA is generally reported as a sum of minutes per week instead of a mean, imputation techniques should be considered if the tracker was worn less than 7 days, but sufficient data (3-5 valid days) is available. Despite insufficient evidence in cancer survivors to date, a consideration when choosing imputation techniques is the potential for variability in MVPA data on weekdays compared to weekends (Broderick et al., 2014). Unfortunately, the majority of studies in exercise oncology have not reported on the imputation techniques used. Future work, with transparent reporting, has the potential to advance our understanding of exercise maintenance in exercise oncology.

In this pilot work, sufficient data for a valid week was defined as 4 valid days, with each day defined as more than 10h of wear time per day. This cut-off was within the recommended 3-5 days and was previously used in exercise oncology literature (Gell et al., 2020). If participants

wore the tracker less than this pre-defined cut-off, their HR data was not incorporated in the MVPA calculation. The available MVPA data was scanned for patterns on specific days of the week and no such patterns were identified. Therefore, if participants wore the tracker less than 7 valid days but had sufficient data (4 valid days), the missing days were imputed with the mean MVPA minutes of the valid days during the specific week.

5.4 Conclusion

Due to the multitude of positive outcomes associated with PA participation, finding feasible and effective ways to support cancer survivors in maintaining an active life is critical. The synchronous delivery of online group-based exercises has the potential to create equal opportunities for all cancer survivors to be active, while at the same time maintaining the quality of program delivery. HC may provide a feasible and effective way to provide additional support in the online environment. Further evidence on the effectiveness of both the online synchronous delivery mode as well as the impact of HC is needed to advance these areas of research for understanding exercise maintenance in individuals living with cancer.

5.5 References

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APPENDIX A: HOME-BASED MAINTENANCE PROGRAM

**Alberta Cancer Exercise (ACE) Remote
Maintenance Class Program Exercise Guide
(8 Week Intervention)**

Legend

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Postural Cues

Cueing Shoulder Retractions

- 1) Have participants stand normally with their back against the wall. They may need to step their feet away from the wall to keep a flat back.
- 2) Have participants rotate their palms so thumbs point out and palms face forwards. They should feel this automatically improve posture - chest lifts, shoulders back and down. Shoulder blades may become flat with the wall. Ensure all participants can feel this.
- 3) Participants should extend their arms out in front of them. This should cause the shoulder blades to no longer sit flat against the wall. Have participants pull their arms back slightly so the shoulders move back and down. Shoulder blades should become flat with the wall.
- 4) Once participants feel this, have them repeat a few more times. Participants should hold the retractions for 3-5 seconds before releasing.

Cueing Core Engagement

- 1) Participants should lie on the ground with their feet planted on the floor. Have them place their fingers on their abdomen, below their belly button, just inside their pelvis. ** can also be completed with their back against the wall if they have difficulty getting down to the floor
- 2) Cue participants to cough a couple times. They should feel their abdominal muscles under their fingers contract. These are the muscles they want to engage during exercises in class.
- 3) Participants should place their pinkies on their pelvis (bony part on the front of their hip) and their thumbs on their low ribs. Cue participants to think about engaging their core and pulling these two landmarks together. They should also feel their lower back pressing into the floor or wall.

Once participants can feel their abdominal muscles engaging. Have them repeat this a few more times, holding the engagement for 3-5s each time.

TIMELINE

The first two weeks will have twice the same session so that the participants have a chance to refamiliarize themselves with the exercises. Following that, tapering will occur and each week will only have one group session.

WEEK 1	Session 1
	Session 1
WEEK 2	Session 2
	Session 2
WEEK 3	Session 3
WEEK 4	Session 4
WEEK 5	Session 5
WEEK 6	Session 6
WEEK 7	Session 7
WEEK 8	Session 8

GROUP EXERCISE CLASS-WEEK 1 DAY 1

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 45 seconds; 2 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential equipment
Ball Wall Squat	Place ball in the small of the back. Lean weight back into the ball and complete a squat. Only go as deep as feels comfortable on the joints NO BALL: Wall squat or regular squats	Stability ball
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO BAND: Scapular Retraction	Band
Cardio	Jumping Jacks	

Circuit 2		Potential equipment
Lateral Raise	Keep the core engaged as the weights are lifted overhead. Cue the core engagement practiced at the beginning of class.	Band Weights
Single Leg Balance	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs.	
Cardio	Butt Kicks	

Circuit 3		Potential equipment
Glute Bridge	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	
Push-Up	Easy: Wall Medium: Incline (hands on bench) Hard: On floor from knees or toes	

Circuit 4- Balance & Core		Potential equipment
Deadbug	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	
Birddog	Easy: one limb at a time Medium: opposite arm and leg, toe stays on the ground	

GROUP EXERCISE CLASS-WEEK 1 DAY 2

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 45 seconds; 2 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		
Circuit 1		Potential equipment
Ball Wall Squat	Place ball in the small of the back. Lean weight back into the ball and complete a squat. Only go as deep as feels comfortable on the joints NO BALL: Wall squat or regular squats	Stability ball
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO BAND: Scapular Retraction	Band
Cardio	Jumping Jacks	

Circuit 2		Potential equipment
Lateral Raise	Keep the core engaged as the weights are lifted overhead. Cue the core engagement practiced at the beginning of class.	Band Weights
Single Leg Balance	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs.	
Cardio	Butt Kicks	

Circuit 3		Potential equipment
Glute Bridge	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	
Push-Up	Easy: Wall Medium: Incline (hands on bench)	

	Hard: On floor from knees or toes	
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Circuit 4- Balance & Core		Potential equipment
Deadbug	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	
Birddog	Easy: one limb at a time Medium: opposite arm and leg, toe stays on the ground	

GROUP EXERCISE CLASS-WEEK 2 DAY 1

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential equipment
Reverse Lunge	Wide stands with toes angled slightly outwards. Ensure participants are engaging the glutes to keep the knees from sagging inwards.	
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Tandem Walking	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Cardio	High Knees	

Circuit 2		Potential equipment
Bicep Curl	Palms facing forward throughout curl. Elbows stay tight to the body. With weights or resistance band NO Weights or Band: alternative weights	Band Weights
Tricep Kickback	Easy: completed single arm like the SA row Hard: completed with both arms at the same time, bent over NO weights: Band press down or alternative weights	Band Weights
Standing Glute Kickback	With arms extended and on toes, place the handle of a resistance band around one foot. Keep appropriate tension by holding the band in place to Kick straight back on one leg. Can also be done in tabletop position on ground. NO band: standing hip extension	
Cardio	Butt Kicks	

Circuit 3		Potential equipment
Chest Press	Lie with back flat on the bench or floor and core engaged. Keep the weights over the chest (not over the face). NO Weights: band under shoulders or alternative weights	Band Weights
Glute Bridge	Easy: Hips on Ground Medium: Lift hips off the ground, rest them back on the ground between reps Hard: Lift hips off the ground and keep hips up throughout the set NO Ball: Glute Bridge (Step outs or kick outs)	
Deadbug	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	

GROUP EXERCISE CLASS-WEEK 2 Day 2

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential equipment
Reverse Lunge	Wide stands with toes angled slightly outwards. Ensure participants are engaging the glutes to keep the knees from sagging inwards.	
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Tandem Walking	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Cardio	High Knees	

Circuit 2		Potential equipment
Bicep Curl	Palms facing forward throughout curl. Elbows stay tight to the body. With weights or resistance band NO Weights or Band: alternative weights	Band Weights
Tricep Kickback	Easy: completed single arm like the SA row Hard: completed with both arms at the same time, bent over NO weights: Band press down or alternative weights	Band Weights
Standing Glute Kickback	With arms extended and on toes, place the handle of a resistance band around one foot. Keep appropriate tension by holding the band in place to Kick straight back on one leg. Can also be done in tabletop position on ground. NO band: standing hip extension	
Cardio	Butt Kicks	

Circuit 3		Potential equipment
Chest Press	Lie with back flat on the bench or floor and core engaged. Keep the weights over the chest (not over the face). NO Weights: band under shoulders or alternative weights	Band Weights
Glute Bridge	Easy: Hips on Ground Medium: Lift hips off the ground, rest them back on the ground between reps Hard: Lift hips off the ground and keep hips up throughout the set NO Ball: Glute Bridge (Step outs or kick outs)	
Deadbug	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	

GROUP EXERCISE CLASS-WEEK 3

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 2 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Sumo Squat	One leg in front of the other. Ensure front heel remains on the ground to prevent unnecessary tension through knee. Complete over by the wall if balance is a concern. If this bothers the knees, complete squats or leg extensions instead.	Weights
Cardio	Marching/Jogging	
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Cardio	Jumping Jacks	

Circuit 2		Potential Equipment
Supine Hamstring Curl	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	Stability Ball
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO BAND: Scapular Retraction	Band
Chest Press – one arm with push up + (supine or standing)	Lie with back flat on the bench and core engaged. Keep the weights over the chest (not over the face). NO Weights: band under shoulders or alternative weights	Weights Band
Single Leg (stand on pillow OR add ball around body)	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Cardio	Speed Skaters	

Circuit 3		
Supine Hamstring Curl	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	Stability Ball
Deadbug	Cue pelvic tilt Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time	
Clamshells	If participants feel any back pain completing this exercise, participants can complete bird dogs instead.	Band
I-Y-T	Lay on your back on the floor. Your arms stay extended throughout the exercise. First form an "I" with your arms then a "Y" and finally a "T". Repeatedly form these letters. Start slowly and avoid ranges of motion, which cause pain. Levels of difficulty: 1) On the floor 2) Elevated	Form Roll

GROUP EXERCISE CLASS-WEEK 4

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Risers (4 high) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 3 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Step Ups	Complete with a tempo of 2 seconds up, 2 seconds down. Participants can change the step height to match their comfort level	Step (stairs)
Isometric T Hold	Wrap a band around the bar and step out to an appropriate resistance level. Ensure hips and shoulders are square. Arms can be against chest or be extended directly in front of chest. Don't let participants over or under rotate to compensate against the resistance band. NO Band: Press against doorframe in same position	Band
Cardio	High Knees	
Circuit 2		
Drinking Bird	Lift one leg and opposite arm into straight line before hinging over at waist as far as comfortable and that allows the participant to return to standing without needing to place foot on ground. Can be completed by the wall for safety. Make sure the upper body and leg are moving in one straight line. Complete for 30 seconds before switching legs	
Single Arm Row with Kickback	This exercise can be completed single arm (on the bench), or with both arms. Ensure participants are keeping a flat back and shoulders stay level while completing the row. NO Weights: Standing row with Triceps extension or alternative weights	Weights
Cardio	Participant Choice	

Circuit 3		Potential Equipment
Shoulder Press	Keep the core engaged as the weights are lifted overhead. Cue the pelvic tilt practiced at the beginning of class. NO Weights: alternative weights	Weights
Monster Walks / lateral leg lifts	Easy: no resistance band Medium/Hard: with resistance band or very slow and low Suggest participants take 10 steps in each direction, alternating throughout the set.	Band
Cardio	2 In – 2 Out	

Circuit 4	
Glute Bridge with Kickouts	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise. For kickouts: Lift one foot off ground, extend knee and return to ground before repeating with other leg.
Push Ups	Easy: Wall Medium: Incline (hands on bench) Hard: On floor from knees or toes
Deadbug	Easy: on wall Medium: on floor from knees Hard: on floor from toes *the farther the feet are apart, the more stable the stance. Complete exercise for intervals of 15-20 seconds, taking breaks if necessary. Work up to a maximum of 1 minute.

GROUP EXERCISE CLASS-WEEK 5

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 10-12 repetitions; 3 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Straight Leg Dead Lift	Straight legs hinge forward from the hip with a strong straight back. Can place stick (broom stick) behind back (between shoulder blades and right down the spine) to ensure only going as far as back stays straight. If more proficient can hold stick or weights in front of body with arms hanging straight down. Leaning forward slow and fast back up (pull from hamstring).	Broom (stick) Weights
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO Band: Bent over row or scapular retraction	Band
Cardio	Jumping Jacks	

Circuit 2		Potential Equipment
Monster Walk / fire hydrants	Easy: no resistance band Medium/Hard: with resistance band or very slow and low Suggest participants take 10 steps in each direction, alternating throughout the set.	Bands
Chest Fly	Keep a soft bend in the elbows and only open the arms until they are parallel with the floor. NO Weight: use alternative weights	Weights Band
Cardio	Speed Skaters	

Circuit 3		Potential Equipment
Bicep Curl + Shoulder Press	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Weights Bands
Single Leg Balance – on pillow/clock taps	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs	
Cardio	High Knees	

Circuit 4	
Plank	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt
I-Y-T	Lay on your back on the floor. Your arms stay extended throughout the exercise. First form an “I” with your arms then a “Y” and finally a “T”. Repeatedly form these letters. Start slowly and avoid ranges of motion, which cause pain. Levels of difficulty: 1) On the floor 2) Elevated
Side Plank w/ hip dip	Normal side plank while dropping straight up and down from the hips. Switch sides after 30 seconds

GROUP EXERCISE CLASS-WEEK 6

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 10-12 repetitions; 3 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Wall Angel	Align your back along the wall with glutes, shoulder blades and head touching the wall.	
Sumo Squat	One leg in front of the other. Ensure front heel remains on the ground to prevent unnecessary tension through knee. Complete over by the wall if balance is a concern. If this bothers the knees, complete squats or leg extensions instead.	
Dips	Sit on a chair/couch/bench go to the edge of this object and place your hands on each side of your hip. Slowly move your buttocks off the object and stabilize yourself with your arms (on a chair/couch/bench) and feet on the floor. Dip down as far as possible and press back up with your arms.	
Cardio	Participant choice!	

Circuit 2	
Tree Pose	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs
Reverse Fly	Tip forward at the hips for a hip hinge so the torso is leaning forward. Let arms start together in front of you to start and then bring the hands back in line with the body. Focus on squeezing shoulder blades down and together. NO Band: Scapular retraction or without weight/weight alternative
Calf Raises	Press weight through the ball of the foot. DO NOT want to roll out onto the baby toe edge of the foot. Standing beside the wall is an option for balance concerns.
Cardio	Speed Skaters

Circuit 3	
Glute busters (w/ or w/out band)	<p>Four-point position (hands under your shoulders and knees under your hips). A band should be tied around your foot and the extremities should be under your hands. Brace your abdominals and lumbar muscle lightly to stabilize the hips and trunk, then extend the leg to straight in line with your body, without rotating or extending the lower back.</p> <p>Think about keeping the whole body still and only pushing your leg back, squeezing the glutes.</p> <p>NO Band: ankle weights or no resistance</p>
Push ups	<p>Easy: Wall</p> <p>Medium: Incline (hands on bench)</p> <p>Hard: On floor from knees or toes</p>
Glute Bridge	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.
Bicycle Riding	<p>Easy: one leg at a time with other foot on ground</p> <p>Medium: Both legs alternating with floor touches</p> <p>Hard: Both legs alternating</p> <p>Cue pelvic tilt</p> <p>ONLY go as far as you can keep the low back in contact with the floor in the pelvic tilt position.</p>

GROUP EXERCISE CLASS-WEEK 7

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute, 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential Equipment
Forward Lunge	Close to a wall if trouble balancing. Adding weight is optional	Weights
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Calf Raises	Press weight through the ball of the foot. DO NOT want to roll out onto the baby toe edge of the foot. Standing beside the wall is an option for balance concerns. To progress: perform single leg, on a step with both legs or hardest single leg on the step	
Cardio	Speed Skaters	

Circuit 2		Potential Equipment
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO BAND: Scapular Retraction	Band Weights
Isometric T Hold	Wrap a band around the bar and step out to an appropriate resistance level. Ensure hips and shoulders are square. Arms can be against chest or be extended directly in front of chest. Don't let participants over or under rotate to compensate against the resistance band. NO Band: Press against doorframe in same position	Band
Cardio	Mountain Climbers on wall Can also perform on the floor or bench height	

Circuit 3		Potential Equipment
Donkey Kicks	Four-point position (hands under the shoulders and your knees under your hips). Keep the knee of the involved leg bent and push the heel up toward the ceiling. Do not arch the lower back as you perform the exercise.	
Chest Press	Lie with back flat on the bench or floor and core engaged. Keep the weights over the chest (not over the face). NO Weights: band under shoulders or alternative weights	Bands / Weights
Fire Hydrants	In tabletop position, ensure core is engaged and back is flat. Lift one knee off of the ground and open hip, ensuring that hips remain flat. Pause at top of movement before returning to start. Can be completed on the wall if difficulty getting to floor	
V-Sit	While seated, lean back until core is engaged. To make more challenging- lean back further or lift feet off ground. Make sure low back is not in any pain and chest is proud.	

GROUP EXERCISE CLASS-WEEK 8

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Risers (4 high) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 minute per exercise; 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Step Ups	Complete with a tempo of 2 seconds up, 2 seconds down. Participants can change the step height to match their comfort level NO Step: forward lunges	Step or Stair
Bicep Curl and Shoulder Press	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise. NO Weights: alternative weights	Weights Bands
Straight Leg Dead Lift	Straight legs hinge forward from the hip with a strong straight back. Can place stick (broom stick) behind back (between shoulder blades and right down the spine) to ensure only going as far as back stays straight. If more proficient can hold stick or weights in front of body with arms hanging straight down. Leaning forward slow and fast back up (pull from hamstring).	Weight Stick (Broom stick)
Cardio	Mountain Climbers on wall	

Circuit 2		Potential Equipment
Side Lunge	Step sideways, bending one knee into a lunge while pushing hips back and keeping heel on ground. Leave other leg straight	
Single Leg Balance with clock taps	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Single Arm Row with	This exercise can be completed single arm (on the bench), or with both arms. Ensure participants are	Weights Bands

Kickback	keeping a flat back and shoulders stay level while completing the row. NO Weights: Standing row with Triceps extension or alternative weights	
Cardio	Stepping on bench (lower height of bench to focus on speed to ensure a cardio rather than strength exercise)	

Circuit 3		Potential Equipment
Push Up and Push-up +	Lay on back with knees bent and feet on the floor. Lift arms to bring the weights above shoulders. Push the weights closer to the ceiling without shrugging your shoulders to your ears or arching the lower back. Only your shoulder blades should move. NO Weight: alternative weights or no resistance	
Glute Busters	Four-point position (hands under your shoulders and knees under your hips). A band should be tied around your foot and the extremities should be under your hands. Brace your abdominals and lumbar muscle lightly to stabilize the hips and trunk, then extend the leg to straight in line with your body, without rotating or extending the lower back. Think about keeping the whole body still and only pushing your leg back, squeezing the glutes. NO Band: ankle weights or no resistance	
Front Plank with shoulder touches	Push-up position. Keep abdominals engaged and tap the opposite shoulder with the hand. Make sure your hips and trunk don't shift to one side as you tap. Your trunk should remain still, so that a water glass could be balanced on your lower back without tipping	

POST SESSION PEER CONVERSATION

After each group exercise session there will be the opportunity for peer conversation. This conversation is facilitated by the RA but led by the participants. The aim is for this to have a natural flow and will be fully dependent on participants needs. We're hoping to achieve a social component, which was lost due to the social isolation regulations, by providing this space for additional peer to peer interaction. The zoom classroom will not have a time constriction and each participant can leave the conversation whenever they prefer.

Alberta Cancer Exercise (ACE) Remote
Maintenance Class Program Exercise Guide
(12 Week Intervention)

Legend

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Postural Cues

Cueing Shoulder Retractions

- 5) Have participants stand normally with their back against the wall. They may need to step their feet away from the wall to keep a flat back.
- 6) Have participants rotate their palms so thumbs point out and palms face forwards. They should feel this automatically improve posture - chest lifts, shoulders back and down. Shoulder blades may become flat with the wall. Ensure all participants can feel this.
- 7) Participants should extend their arms out in front of them. This should cause the shoulder blades to no longer sit flat against the wall. Have participants pull their arms back slightly so the shoulders move back and down. Shoulder blades should become flat with the wall.
- 8) Once participants feel this, have them repeat a few more times. Participants should hold the retractions for 3-5 seconds before releasing.

Cueing Core Engagement

- 4) Participants should lie on the ground with their feet planted on the floor. Have them place their fingers on their abdomen, below their belly button, just inside their pelvis. ** can also be completed with their back against the wall if they have difficulty getting down to the floor
- 5) Cue participants to cough a couple times. They should feel their abdominal muscles under their fingers contract. These are the muscles they want to engage during exercises in class.
- 6) Participants should place their pinkies on their pelvis (bony part on the front of their hip) and their thumbs on their low ribs. Cue participants to think about engaging their core and pulling these two landmarks together. They should also feel their lower back pressing into the floor or wall.

Once participants can feel their abdominal muscles engaging. Have them repeat this a few more times, holding the engagement for 3-5s each time.

TIMELINE

The first two weeks will have twice the same session so that the participants have a chance to refamiliarize themselves with the exercises. Following that, tapering will occur and each week will only have one group session.

WEEK 1	Session 1
	Session 1
WEEK 2	Session 2
	Session 2
WEEK 3	Session 3
WEEK 4	Session 4
WEEK 5	Session 5
WEEK 6	Session 6
WEEK 7	Session 7
WEEK 8	Session 8
WEEK 9	Session 9
WEEK 10	Session 10
WEEK 11	Session 11
WEEK 12	Session 12

GROUP EXERCISE CLASS-WEEK 1 DAY 1

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 45 seconds; 2 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential equipment
Ball Wall Squat	Place ball in the small of the back. Lean weight back into the ball and complete a squat. Only go as deep as feels comfortable on the joints NO BALL: Wall squat or regular squats	Stability ball
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO BAND: Scapular Retraction	Band
Cardio	Jumping Jacks	

Circuit 2		Potential equipment
Lateral Raise	Keep the core engaged as the weights are lifted overhead. Cue the core engagement practiced at the beginning of class.	Band Weights
Single Leg Balance	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs.	
Cardio	Butt Kicks	

Circuit 3		Potential equipment
Glute Bridge	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	
Push-Up	Easy: Wall Medium: Incline (hands on bench) Hard: On floor from knees or toes	

Circuit 4- Balance & Core		Potential equipment
Deadbug	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	
Birddog	Easy: one limb at a time Medium: opposite arm and leg, toe stays on the ground	

GROUP EXERCISE CLASS-WEEK 1 DAY 2

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 45 seconds; 2 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential equipment
Ball Wall Squat	Place ball in the small of the back. Lean weight back into the ball and complete a squat. Only go as deep as feels comfortable on the joints NO BALL: Wall squat or regular squats	Stability ball
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO BAND: Scapular Retraction	Band
Cardio	Jumping Jacks	

Circuit 2		Potential equipment
Lateral Raise	Keep the core engaged as the weights are lifted overhead. Cue the core engagement practiced at the beginning of class.	Band Weights
Single Leg Balance	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs.	
Cardio	Butt Kicks	

Circuit 3		Potential equipment
Glute Bridge	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	
Push-Up	Easy: Wall Medium: Incline (hands on bench) Hard: On floor from knees or toes	

Circuit 4- Balance & Core		Potential equipment
Deadbug	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	
Birddog	Easy: one limb at a time Medium: opposite arm and leg, toe stays on the ground	

GROUP EXERCISE CLASS-WEEK 2 DAY 1

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential equipment
Reverse Lunge	Wide stands with toes angled slightly outwards. Ensure participants are engaging the glutes to keep the knees from sagging inwards.	
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Tandem Walking	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Cardio	High Knees	

Circuit 2		Potential equipment
Bicep Curl	Palms facing forward throughout curl. Elbows stay tight to the body. With weights or resistance band NO Weights or Band: alternative weights	Band Weights
Tricep Kickback	Easy: completed single arm like the SA row Hard: completed with both arms at the same time, bent over NO weights: Band press down or alternative weights	Band Weights
Standing Glute Kickback	With arms extended and on toes, place the handle of a resistance band around one foot. Keep appropriate tension by holding the band in place to Kick straight back on one leg. Can also be done in tabletop position on ground. NO band: standing hip extension	
Cardio	Butt Kicks	

Circuit 3		Potential equipment
Chest Press	Lie with back flat on the bench or floor and core engaged. Keep the weights over the chest (not over the face). NO Weights: band under shoulders or alternative weights	Band Weights
Glute Bridge	Easy: Hips on Ground Medium: Lift hips off the ground, rest them back on the ground between reps Hard: Lift hips off the ground and keep hips up throughout the set NO Ball: Glute Bridge (Step outs or kick outs)	
Deadbug	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	

GROUP EXERCISE CLASS-WEEK 2 Day 2

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential equipment
Reverse Lunge	Wide stands with toes angled slightly outwards. Ensure participants are engaging the glutes to keep the knees from sagging inwards.	
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Tandem Walking	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Cardio	High Knees	

Circuit 2		Potential equipment
Bicep Curl	Palms facing forward throughout curl. Elbows stay tight to the body. With weights or resistance band NO Weights or Band: alternative weights	Band Weights
Tricep Kickback	Easy: completed single arm like the SA row Hard: completed with both arms at the same time, bent over NO weights: Band press down or alternative weights	Band Weights
Standing Glute Kickback	With arms extended and on toes, place the handle of a resistance band around one foot. Keep appropriate tension by holding the band in place to Kick straight back on one leg. Can also be done in tabletop position on ground. NO band: standing hip extension	
Cardio	Butt Kicks	

Circuit 3		Potential equipment
Chest Press	Lie with back flat on the bench or floor and core engaged. Keep the weights over the chest (not over the face). NO Weights: band under shoulders or alternative weights	Band Weights
Glute Bridge	Easy: Hips on Ground Medium: Lift hips off the ground, rest them back on the ground between reps Hard: Lift hips off the ground and keep hips up throughout the set NO Ball: Glute Bridge (Step outs or kick outs)	
Deadbug	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	

GROUP EXERCISE CLASS-WEEK 3

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 2 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Sumo Squat	One leg in front of the other. Ensure front heel remains on the ground to prevent unnecessary tension through knee. Complete over by the wall if balance is a concern. If this bothers the knees, complete squats or leg extensions instead.	Weights
Cardio	Marching/Jogging	
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Cardio	Jumping Jacks	

Circuit 2		Potential Equipment
Supine Hamstring Curl	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	Stability Ball
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO BAND: Scapular Retraction	Band
Chest Press – one arm with push up + (supine or standing)	Lie with back flat on the bench and core engaged. Keep the weights over the chest (not over the face). NO Weights: band under shoulders or alternative weights	Weights Band
Single Leg (stand on pillow OR add ball around body)	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Cardio	Speed Skaters	

Circuit 3		
Supine Hamstring Curl	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	Stability Ball
Deadbug	Cue pelvic tilt Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time	
Clamshells	If participants feel any back pain completing this exercise, participants can complete bird dogs instead.	Band
I-Y-T	Lay on your back on the floor. Your arms stay extended throughout the exercise. First form an "I" with your arms then a "Y" and finally a "T". Repeatedly form these letters. Start slowly and avoid ranges of motion, which cause pain. Levels of difficulty: 3) On the floor 4) Elevated	Form Roll

GROUP EXERCISE CLASS-WEEK 4

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Risers (4 high) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 3 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Step Ups	Complete with a tempo of 2 seconds up, 2 seconds down. Participants can change the step height to match their comfort level	Step (stairs)
Isometric T Hold	Wrap a band around the bar and step out to an appropriate resistance level. Ensure hips and shoulders are square. Arms can be against chest or be extended directly in front of chest. Don't let participants over or under rotate to compensate against the resistance band. NO Band: Press against doorframe in same position	Band
Cardio	High Knees	
Circuit 2		
Drinking Bird	Lift one leg and opposite arm into straight line before hinging over at waist as far as comfortable and that allows the participant to return to standing without needing to place foot on ground. Can be completed by the wall for safety. Make sure the upper body and leg are moving in one straight line. Complete for 30 seconds before switching legs	
Single Arm Row with Kickback	This exercise can be completed single arm (on the bench), or with both arms. Ensure participants are keeping a flat back and shoulders stay level while completing the row. NO Weights: Standing row with Triceps extension or alternative weights	Weights
Cardio	Participant Choice	

Circuit 3		Potential Equipment
Shoulder Press	Keep the core engaged as the weights are lifted overhead. Cue the pelvic tilt practiced at the beginning of class. NO Weights: alternative weights	Weights
Monster Walks / lateral leg lifts	Easy: no resistance band Medium/Hard: with resistance band or very slow and low Suggest participants take 10 steps in each direction, alternating throughout the set.	Band
Cardio	2 In – 2 Out	

Circuit 4	
Glute Bridge with Kickouts	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise. For kickouts: Lift one foot off ground, extend knee and return to ground before repeating with other leg.
Push Ups	Easy: Wall Medium: Incline (hands on bench) Hard: On floor from knees or toes
Deadbug	Easy: on wall Medium: on floor from knees Hard: on floor from toes *the farther the feet are apart, the more stable the stance. Complete exercise for intervals of 15-20 seconds, taking breaks if necessary. Work up to a maximum of 1 minute.

GROUP EXERCISE CLASS-WEEK 5

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 10-12 repetitions; 3 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Straight Leg Dead Lift	Straight legs hinge forward from the hip with a strong straight back. Can place stick (broom stick) behind back (between shoulder blades and right down the spine) to ensure only going as far as back stays straight. If more proficient can hold stick or weights in front of body with arms hanging straight down. Leaning forward slow and fast back up (pull from hamstring).	Broom (stick) Weights
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO Band: Bent over row or scapular retraction	Band
Cardio	Jumping Jacks	

Circuit 2		Potential Equipment
Monster Walk / fire hydrants	Easy: no resistance band Medium/Hard: with resistance band or very slow and low Suggest participants take 10 steps in each direction, alternating throughout the set.	Bands
Chest Fly	Keep a soft bend in the elbows and only open the arms until they are parallel with the floor. NO Weight: use alternative weights	Weights Band
Cardio	Speed Skaters	

Circuit 3		Potential Equipment
Bicep Curl + Shoulder Press	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Weights Bands
Single Leg Balance – on pillow/clock taps	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs	
Cardio	High Knees	

Circuit 4	
Plank	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt
I-Y-T	Lay on your back on the floor. Your arms stay extended throughout the exercise. First form an “I” with your arms then a “Y” and finally a “T”. Repeatedly form these letters. Start slowly and avoid ranges of motion, which cause pain. Levels of difficulty: 3) On the floor 4) Elevated
Side Plank w/ hip dip	Normal side plank while dropping straight up and down from the hips. Switch sides after 30 seconds

GROUP EXERCISE CLASS-WEEK 6

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 10-12 repetitions; 3 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential Equipment
Reverse Lunge	Wide stands with toes angled slightly outwards. Ensure participants are engaging the glutes to keep the knees from sagging inwards.	
Reverse Fly	Tip forward at the hips for a hip hinge so the torso is leaning forward. Let arms start together in front of you to start and then bring the hands back in line with the body. Focus on squeezing shoulder blades down and together. NO Band: Scapular retraction or without weight/weight alternative	Weights
Cardio	Speed Skaters	

Circuit 2		Potential Equipment
Straight Leg Dead Lift	Straight legs hinge forward from the hip with a strong straight back. Can place stick (broom stick) behind back (between shoulder blades and right down the spine) to ensure only going as far as back stays straight. If more proficient can hold stick or weights in front of body with arms hanging straight down. Leaning forward slow and fast back up (pull from hamstring).	Broom (stick) Weights
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Cardio	Speed Skaters	

Circuit 3		Potential Equipment
Dips	Sit on a chair/couch/bench go to the edge of this object and place your hands on each side of your hip. Slowly move your buttocks off the object and stabilize yourself with your arms (on a chair/couch/bench) and feet on the floor. Dip down as far as possible and press back up with your arms.	Chair

Drinking Bird	Lift one leg and opposite arm into straight line before hinging over at waist as far as comfortable and that allows the participant to return to standing without needing to place foot on ground. Can be completed by the wall for safety. Make sure the upper body and leg are moving in one straight line. Complete for 30 seconds before switching legs	
Cardio	High Knees	

Circuit 4		
Chest Press +	Lay on back with knees bent and feet on the floor. Lift arms to bring the weights above shoulders. Push the weights closer to the ceiling without shrugging your shoulders to your ears or arching the lower back. Only your shoulder blades should move. NO Weight: alternative weights or no resistance	Band or Weights
Deadbug	Easy: on wall Medium: on floor from knees Hard: on floor from toes *the farther the feet are apart, the more stable the stance. Complete exercise for intervals of 15-20 seconds, taking breaks if necessary. Work up to a maximum of 1 minute.	
Donkey Kicks	Four-point position (hands under the shoulders and your knees under your hips). Keep the knee of the involved leg bent and push the heel up toward the ceiling. Do not arch the lower back as you perform the exercise.	Band

GROUP EXERCISE CLASS-WEEK 7

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Risers (4 high) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute; 3 sets per circuit - Repeat all 3 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Step Ups	Complete with a tempo of 2 seconds up, 2 seconds down. Participants can change the step height to match their comfort level NO Step: forward lunges	Step or Stair
Isometric T Hold	Wrap a band around the bar and step out to an appropriate resistance level. Ensure hips and shoulders are square. Arms can be against chest or be extended directly in front of chest. Don't let participants over or under rotate to compensate against the resistance band. NO Band: Press against doorframe in same position	Band
Cardio	High Knees	
Circuit 2		
Single Arm Row with Kickback	This exercise can be completed single arm (on the bench), or with both arms. Ensure participants are keeping a flat back and shoulders stay level while completing the row. NO Weights: Standing row with Triceps extension or alternative weights	Weights
Single Leg Balance – on pillow/clock taps	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs	
Cardio	Participant Choice	
Circuit 3		Potential Equipment
Shoulder Press	Keep the core engaged as the weights are lifted overhead. Cue the pelvic tilt practiced at the beginning	Weights

	of class. NO Weights: alternative weights	
Monster Walks / lateral leg lifts	Easy: no resistance band Medium/Hard: with resistance band or very slow and low Suggest participants take 10 steps in each direction, alternating throughout the set.	Band
Cardio	2 In – 2 Out	

Circuit 4	
Glute Bridge with Kickouts	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise. For kickouts: Lift one foot off ground, extend knee and return to ground before repeating with other leg.
Push Ups	Easy: Wall Medium: Incline (hands on bench) Hard: On floor from knees or toes
Deadbug	Easy: on wall Medium: on floor from knees Hard: on floor from toes *the farther the feet are apart, the more stable the stance. Complete exercise for intervals of 15-20 seconds, taking breaks if necessary. Work up to a maximum of 1 minute.

GROUP EXERCISE CLASS-WEEK 8

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Stability Ball - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 10-12 repetitions; 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential Equipment
Sumo Squat	One leg in front of the other. Ensure front heel remains on the ground to prevent unnecessary tension through knee. Complete over by the wall if balance is a concern. If this bothers the knees, complete squats or leg extensions instead.	
Wall Angel	Align your back along the wall with glutes, shoulder blades and head touching the wall. Hard: Lat pulldown	Bands
Dips	Sit on a chair/couch/bench go to the edge of this object and place your hands on each side of your hip. Slowly move your buttocks off the object and stabilize yourself with your arms (on a chair/couch/bench) and feet on the floor. Dip down as far as possible and press back up with your arms.	Chair
Cardio	Participant choice!	

Circuit 2		Potential Equipment
Reverse Fly	Tip forward at the hips for a hip hinge so the torso is leaning forward. Let arms start together in front of you to start and then bring the hands back in line with the body. Focus on squeezing shoulder blades down and together. NO Band: Scapular retraction or without weight/weight alternative	Weights
Tree Pose	Let participants move over toward the wall if balance is a concern. Complete for 30 seconds before switching legs	

Calf Raises	Press weight through the ball of the foot. DO NOT want to roll out onto the baby toe edge of the foot. Standing beside the wall is an option for balance concerns.	Ledge (Step, Stairs)
Cardio	Speed Skaters	

Circuit 3		
Glute busters (w/ or w/out band)	<p>Four-point position (hands under your shoulders and knees under your hips). A band should be tied around your foot and the extremities should be under your hands. Brace your abdominals and lumbar muscle lightly to stabilize the hips and trunk, then extend the leg to straight in line with your body, without rotating or extending the lower back.</p> <p>Think about keeping the whole body still and only pushing your leg back, squeezing the glutes.</p> <p>NO Band: ankle weights or no resistance</p>	
Push ups	<p>Easy: Wall</p> <p>Medium: Incline (hands on bench)</p> <p>Hard: On floor from knees or toes</p>	
Plank	<p>Easy: on the wall</p> <p>Medium: on knees and elbows on the floor</p> <p>Hard: On toes and elbows on the floor</p> <p>Cue straight line from point of contact to top of the head</p>	
Heel touches	<p>Lay on your back with your knees bent. Lift shoulders off the ground. With your arms by the side. Slide down alternating with your hands in the direction of your heels.</p>	

GROUP EXERCISE CLASS-WEEK 9

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute, 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Split Squat	Close to a wall if trouble balancing. Adding weight is optional Hard: Bulgarian Split Squat	Weights
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Calf Raises	Press weight through the ball of the foot. DO NOT want to roll out onto the baby toe edge of the foot. Standing beside the wall is an option for balance concerns. To progress: perform single leg, on a step with both legs or hardest single leg on the step	
Cardio	Speed Skaters	

Circuit 2		Potential Equipment
Standing Row	Cue shoulder retractions from the beginning of class. Loop the resistance band around bar (by mirror), standing staggered stance. Keep the core engaged and shoulders back and down while pulling back on the band. NO BAND: Scapular Retraction	Band Weights
Isometric T Hold	Wrap a band around the bar and step out to an appropriate resistance level. Ensure hips and shoulders are square. Arms can be against chest or be extended directly in front of chest. Don't let participants over or under rotate to compensate against the resistance band. NO Band: Press against doorframe in same position	Band
Cardio	Mountain Climbers on wall Can also perform on the floor or bench height	

Circuit 3		Potential Equipment
Chest Press	Lie with back flat on the bench or floor and core engaged. Keep the weights over the chest (not over the face). NO Weights: band under shoulders or alternative weights	Bands / Weights Ball
Donkey Kicks	Four-point position (hands under the shoulders and your knees under your hips). Keep the knee of the involved leg bent and push the heel up toward the ceiling. Do not arch the lower back as you perform the exercise.	
Fire Hydrants	In tabletop position, ensure core is engaged and back is flat. Lift one knee off of the ground and open hip, ensuring that hips remain flat. Pause at top of movement before returning to start. Can be completed on the wall if difficulty getting to floor	
V-Sit	While seated, lean back until core is engaged. To make more challenging- lean back further or lift feet off ground. Make sure low back is not in any pain and chest is proud.	

GROUP EXERCISE CLASS-WEEK 10

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Risers (4 high) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 minute per exercise; 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique
**Spend the first 10-15 minutes teaching the postural cues on pg.3	

Circuit 1		Potential Equipment
Step Ups	Complete with a tempo of 2 seconds up, 2 seconds down. Participants can change the step height to match their comfort level NO Step: forward lunges	Step or Stair
Single Arm Row with Kickback	This exercise can be completed single arm (on the bench), or with both arms. Ensure participants are keeping a flat back and shoulders stay level while completing the row. NO Weights: Standing row with Triceps extension or alternative weights	Weights Bands
Monster Walks / lateral leg lifts	Easy: no resistance band Medium/Hard: with resistance band or very slow and low Suggest participants take 10 steps in each direction, alternating throughout the set.	Band
Cardio	Mountain Climbers on wall	

Circuit 2		Potential Equipment
Straight Leg Dead Lift	Straight legs hinge forward from the hip with a strong straight back. Can place stick (broom stick) behind back (between shoulder blades and right down the spine) to ensure only going as far as back stays straight. If more proficient can hold stick or weights in front of body with arms hanging straight down. Leaning forward slow and fast back up (pull from hamstring).	Weight Stick (Broom stick)
External Shoulder rotation	Hold an elastic band with a 90° bend in your elbows. Keeping your shoulders retracted, externally rotate the arms against the resistance of the band in a controlled movement. Levels of difficulty: 1) Anchor the exercise band around a pole and externally rotate one arm at a time	Bands

	2) Anchor with one arm and only externally rotate with the other arm 3) Externally rotate both arms at the same time	
Single Leg Balance with clock taps	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Cardio	Stepping on bench (lower height of bench to focus on speed to ensure a cardio rather than strength exercise)	

Circuit 3		
Plank	Easy: knees bent, one limb at a time Medium: knees bent, opposite arm and leg at the same time Cue pelvic tilt	
Glute Bridge	Hip lift off of the ground, pause for a second at top and release back down to mat. Ensure core is engaged throughout exercise.	
Side Plank w/ hip dip	Normal side plank while dropping straight up and down from the hips. Switch sides after 30 seconds	

GROUP EXERCISE CLASS-WEEK 11

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 Minute, 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential Equipment
Reverse Lunge	Wide stands with toes angled slightly outwards. Ensure participants are engaging the glutes to keep the knees from sagging inwards.	Weights
Reverse Fly	Tip forward at the hips for a hip hinge so the torso is leaning forward. Let arms start together in front of you to start and then bring the hands back in line with the body. Focus on squeezing shoulder blades down and together. NO Band: Scapular retraction or without weight/weight alternative	Weights
Isometric T Hold	Wrap a band around the bar and step out to an appropriate resistance level. Ensure hips and shoulders are square. Arms can be against chest or be extended directly in front of chest. Don't let participants over or under rotate to compensate against the resistance band. NO Band: Press against doorframe in same position	Band
Cardio	Speed Skaters	

Circuit 2		Potential Equipment
Lat Pulldown	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise.	Band
Monster Walks / lateral leg lifts	Easy: no resistance band Medium/Hard: with resistance band or very slow and low Suggest participants take 10 steps in each direction, alternating throughout the set.	Band
Drinking Bird	Lift one leg and opposite arm into straight line before hinging over at waist as far as comfortable and that	

	allows the participant to return to standing without needing to place foot on ground. Can be completed by the wall for safety. Make sure the upper body and leg are moving in one straight line. Complete for 30 seconds before switching legs	
Cardio	Mountain Climbers on wall Can also perform on the floor or bench height	

Circuit 3		Potential Equipment
Push ups	Easy: Wall Medium: Incline (hands on bench) Hard: On floor from knees or toes	
Fire Hydrants	In tabletop position, ensure core is engaged and back is flat. Lift one knee off of the ground and open hip, ensuring that hips remain flat. Pause at top of movement before returning to start. Can be completed on the wall if difficulty getting to floor	
V-Sit	While seated, lean back until core is engaged. To make more challenging- lean back further or lift feet off ground. Make sure low back is not in any pain and chest is proud.	

GROUP EXERCISE CLASS-WEEK 12

POTENTIAL EQUIPMENT	PROGRAM DESIGN
<ul style="list-style-type: none"> - Light & medium weight dumbbells (appropriate weights to complete 8-12 repetitions) - Risers (4 high) - Exercise Mat - Resistance Bands 	<ul style="list-style-type: none"> - 1 minute per exercise; 2 sets per circuit - Repeat all 4 exercises in each circuit (including 1 minute of cardio) before repeating the circuit. - Allow participants to take breaks within the core exercises if needed to ensure proper technique

****Spend the first 10-15 minutes teaching the postural cues on pg.3**

Circuit 1		Potential Equipment
Step Ups	Complete with a tempo of 2 seconds up, 2 seconds down. Participants can change the step height to match their comfort level NO Step: forward lunges	Step or Stair
Bicep Curl and Shoulder Press	Cue shoulder retraction and pelvic tilt. Make sure participants are not arching through the low back while completing this exercise. NO Weights: alternative weights	Weights Bands
Straight Leg Dead Lift	Straight legs hinge forward from the hip with a strong straight back. Can place stick (broom stick) behind back (between shoulder blades and right down the spine) to ensure only going as far as back stays straight. If more proficient can hold stick or weights in front of body with arms hanging straight down. Leaning forward slow and fast back up (pull from hamstring).	Weight Stick (Broom stick)
Cardio	Mountain Climbers on wall	

Circuit 2		Potential Equipment
Side Lunge	Step sideways, bending one knee into a lunge while pushing hips back and keeping heel on ground. Leave other leg straight	
Single Leg Balance with clock taps	Walk heel to toe in a line. If participants feel more comfortable, they can walk beside a wall	
Single Arm Row with Kickback	This exercise can be completed single arm (on the bench), or with both arms. Ensure participants are keeping a flat back and shoulders stay level while	Weights Bands

	<p>completing the row.</p> <p>NO Weights: Standing row with Triceps extension or alternative weights</p>	
Cardio	<p>Stepping on bench (lower height of bench to focus on speed to ensure a cardio rather than strength exercise)</p>	

Circuit 3		Potential Equipment
Push Up and Push-up +	<p>Lay on back with knees bent and feet on the floor. Lift arms to bring the weights above shoulders. Push the weights closer to the ceiling without shrugging your shoulders to your ears or arching the lower back. Only your shoulder blades should move.</p> <p>NO Weight: alternative weights or no resistance</p>	
Glute Busters	<p>Four-point position (hands under your shoulders and knees under your hips). A band should be tied around your foot and the extremities should be under your hands. Brace your abdominals and lumbar muscle lightly to stabilize the hips and trunk, then extend the leg to straight in line with your body, without rotating or extending the lower back. Think about keeping the whole body still and only pushing your leg back, squeezing the glutes.</p> <p>NO Band: ankle weights or no resistance</p>	
Front Plank with shoulder touches	<p>Push-up position. Keep abdominals engaged and tap the opposite shoulder with the hand. Make sure your hips and trunk don't shift to one side as you tap. Your trunk should remain still, so that a water glass could be balanced on your lower back without tipping</p>	

POST SESSION PEER CONVERSATION

After each group exercise session there will be the opportunity for peer conversation. This conversation is facilitated by the RA but led by the participants. The aim is for this to have a natural flow and will be fully dependent on participants needs. We're hoping to achieve a social component, which was lost due to the social isolation regulations, by providing this space for additional peer to peer interaction. The zoom classroom will not have a time constriction and each participant can leave the conversation whenever they prefer.

APPENDIX B: HEALTH COACHING QUESTIONNAIRE

WEEKLY QUESTIONNAIRE

Name:

Date:

Please circle the number that best describes you in this moment:

No Fatigue (Fatigue = lack of Energy)	1	2	3	4	5	6	7	8	9	10	Worst Possible Fatigue
No Loneliness	1	2	3	4	5	6	7	8	9	10	Worst Possible Loneliness
No Stress	1	2	3	4	5	6	7	8	9	10	Worst Possible Stress
Satisfied with personal relationships	1	2	3	4	5	6	7	8	9	10	Not satisfied with personal relationships
Best Wellbeing	1	2	3	4	5	6	7	8	9	10	Worst Possible Wellbeing

Additional Comments:

APPENDIX C: HEALTH COACHING EDUCATIONAL TOPICS

Alberta Cancer Exercise (ACE) Remote Maintenance Educational Topics Protocol

Legend

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Maintaining Motivation	pg 32

TENTATIVE TIMELINE

This is a tentative timeline of when educational topics will be discussed during health coaching.

However, all of these topics are rough guidance points and education should be adapted based on participants needs and always be patient focused.

Week 1: Goal Setting

Week 2: Monitoring Behaviour

Week 3: Barrier Management

Week 4: Social Support

Week 5: Stress Management

Week 6: Adapting the Program (Mid-point participant feedback)

Week 7: Self-Compassion

Week 8: Sleep & Nutrition

Week 9: Reflection

Week 10: Health Media

Week 11: Remote Resources

Week 12: Maintaining Motivation

INSTRUCTOR EDUCATIONAL TOPICS PROTOCOL

1) Goal Setting

- Importance: provides guidance and mindfulness
- Setting SMART² goals
 - o **Specific:** What exactly do you want to accomplish? Where? When? Why? How much?
 - o **Measurable:** Are you able to assess your progress?
 - o **Attainable:** Is your goal within your reach given your current situation?
 - o **Realistic:** Are you both willing and able to work towards your goal?
 - o **Timely:** What is the deadline for completing your goal?
 - o **Together:** Who is supporting you to be active?
- Important to consider:
 - o Set long-term and short-term goals
 - o Challenge yourself
 - o Focus on the process
 - o Re-evaluate your progress and goals frequently
- Participant questions:
 - o Do you have any goals already?
 - o If not, think of your goals over the next week
- If participant would like to have more information: pg. 10

2) Monitoring Behaviour

- Importance: Allows for instant feedback on previously set goals, elevates awareness
- Options:
 - o Exercise Log/Diary
 - o Smart watch
 - o Tracking App
 - o Simply taking some time at night to think about accomplishments
- Important to consider:
 - o Don't evaluate only observe
 - o Make it a continuous habit
- Participant questions:
 - o Are you using anything already to track PA levels?
 - How often?
 - o Which method of tracking would you prefer?
- If participant would like to have more information: pg. 13

3) Barrier Management

- Importance: Planning for barriers may help you cope with them better
- 9 most common Barriers in CS:
 - o Lack of Self discipline
 - o Fatigue
 - o Lack of Time
 - o Exercise not a Priority
 - o Lack of enjoyment
 - o Lack of interest
 - o Lack of encouragement
 - o Bad weather
 - o Tired
- Make dependent on individual's barriers
- Participant Questions:
 - o Which barriers do you anticipate?
 - o What is the most common reason for you not to exercise?
- If participant would like to have more information: pg. 15

4) Social Support

- Importance: Is a crucial piece in supporting long lasting behaviour change
- Can be in many forms:
 - o Family members
 - o Friends
 - o Even Dogs
- Be participant specific ask about their loved ones (with names) let them guide the conversation
 - o Does ... support you to stay active
 - o How? Are they exercising with you?
 - o What would you like to change?
- If participant would like to have more information: pg. 17

5) Stress Management

- Importance: Coping mechanisms
- Eustress vs Distress
- Relaxation training
 - o Structured process that requires practice
- Examples:
 - o Body scan
 - o Progressive Muscle relaxation
 - o Meditation
 - o Yoga
 - o Stretching
 - o Self-hypnosis
 - o Prayer

- Music / Sound
 - Diaphragmatic breathing
- Mind Body Connection
- Participant question:
 - Have you tried these techniques?
 - Awareness of Body/Mind state?
- If participant would like to have more information: pg. 18

6) Adapting the Program

- Importance: Variation makes exercise more exciting and providing different stimuli for your muscles is actually beneficial
- Possible opportunities for adapting your program (FITT- Principle)
 - **FREQUENCY**

Add an extra day of exercise to your week. Add a few more repetitions, or even another set to your resistance exercises.

- **INTENSITY**

Work a little harder than you have been. Increase the weight of your resistance exercises or add some jogging into your daily walks. Continue to challenge yourself but stay within the recommended intensity guidelines.

- **TYPE**

Switch around your exercises – try different exercises, move from resistance bands to dumbbells or start cycling instead of walking. Try a yoga or indoor cycling class. Variety!

- **TIME**

Increase the total amount of time of your average exercise session.

- Participant Question:
 - Have you already tried adapting the home program?
- Potentially explain how varying the home program works
 - Exercise Appendix
 - Recommended options behind each Exercise
- If participant would like to have more information: pg. 20

7) Self-Compassion

- Importance: Key to treating yourself healthy
- Giving same kindness to ourselves that we would give to others

- 3 Elements:
 - Self-kindness vs Self-judgment
 - Common Humanity vs. Isolation
 - Mindfulness vs Over-identification
- Strategies:
 - Breathing
 - Petting a pet
 - Cup of tea
- Participant question:
 - Friend is struggling. How would you respond?
 - You're struggling. How do you respond to yourself?
 - Differences Similarities?
- If participant would like to have more information: pg. 21

8) A) Sleep

- Importance: Sleep helps us recover and rebuild physically and mentally
- Focus:
 - Routine
 - Length
 - Conditions
 - Strategies
- Participant questions:
 - What is your daily routine?
 - What do you do before you go to bed?
 - What would be your ideal length? When do you feel most rested?
- If participant would like to have more information: pg. 24

B) Nutrition

- Importance: Can affect weight, strength, and energy
- Focus:
 - Balanced meals
 - Fresh
 - Calories
 - Caution with supplements
 - Drinking enough
- Participant questions:
 - What are your eating habits? Time? Place? Together?
 - What are things you would want to change and why?
 - Strategies? Meal prepping? Grocery list? Big water bottle?
- If participant would like to have more information: pg. 26

9) Reflection

- Importance: We often want to strive for more but seldom take the time to celebrate how far we've come

- Focus:
 - Gibb's Reflection cycle
 - Learning from past successes and failures
 - Readjusting your goals
- Participant questions:
 - What are you proud of?
 - Where do you see yourself on the journey to your previously established goals?
 - What are ways in which you can readjust or build upon your goals?
- If participant would like to have more information: pg. 28

10) Health Media

- Importance: There is a lot of information online but a lot of it is also wrong or unsafe for you → creating awareness of which information is reliable
- Consider:
 - Reliable sources:
 - Government designation or degree
 - Certified Exercise Physiologist (CEP)
 - Registered Dietitian (RD)
 - Does the person claiming something use peer-reviewed references?
 - Questionable sources:
 - Nutritionist
 - Don't need certificate or even degree
 - Any radical breakthrough results
 - Social media adds
 - Are the sources cancer specific?
- Don't hesitate to ask any of our CEPs about information you found online
- If participant would like to have more information: pg. 30

11) Remote Resources (Maybe updated throughout study based on available resources)

- ACE maintenance package with video future
- Wellspring offers remote programs
 - @ <https://wel.gametime.net/auth>
- Any other cancer specific remote resources?
- Ask participant questions about experience with these
 - Did you try any of them?
 - What were your thoughts?
- If participant would like to have more information: pg. 31

12) Maintaining Motivation

- Importance: key tool required to achieve lifelong fitness
- Key sources of motivation
 - Fun, enjoyment, stimulation
 - A feeling of accomplishment (Meaningfulness)
 - The pleasure of learning
 - A well-identified benefit such as sleeping better and feeling calmer
- Aim to fuel these sources by
 - Being mindful
 - While Exercising
 - While making healthy life choices
 - Setting Goals/ Making it meaningful
 - Monitoring your process
- Participant question:
 - What motivates you to keep exercising?
- If participant would like to have more information: pg. 32

OPTIONAL ADDITIONAL PARTICIPANT RESOURCES

Goal Setting

“If you don't know where you are going, you'll end up someplace else.” – Yogi Berra

Goal setting is an excellent first step for motivating yourself to be physically active. Identifying your goals are the first steps to committing yourself to exercise behavior change.

A goal should provide guidance, direction and help track your progress. Goals like ‘to gain or lose weight’, ‘eat better’, or ‘have less stress’ are too vague and unspecific to help much in making change. Use the S.M.A.R.T. goal setting criteria to help put more detail into your goal.

SMART² Goals are:

Specific: What exactly do you want to accomplish? Where? When? Why? How much?

Measurable: Are you able to assess your progress?

Attainable: Is your goal within your reach given your current situation?

Realistic: Are you both willing and able to work towards your goal?

Timely: What is the deadline for completing your goal?

Together: Who is supporting you to be active?

Here's an example of a SMART goal: *“For the next 8 weeks, I will commit to walking for 20 minutes after dinner with my partner.”*

Consider these points when developing your SMART goals:

Set both long-term and short-term goals: Set a long-term goal you want to achieve by the end of the 12-week exercise program and then set short-term goals; those that you want to achieve weekly that will help you reach your long-term goal.

Challenge yourself: Make your goals ambitious enough that you are proud of the accomplishment when you meet your goals.

Focus on the process: Look forward to the participation and not simply getting it over with. Goals should embrace the process that work towards the outcome.

Re-evaluate your goals regularly: Goals need to be adjusted when they've been attained – or when you are not achieving them. In order to stay motivated, set challenging goals that you can reach. Find that balance by regularly re-evaluating the goals you have set.

Outcome vs. Process Goals: Outcome goals are results that you want to achieve. These may seem unattainable, so process goals are developed to help get you there. Process goals are small steps used to achieve a larger outcome goal. For example: “I want to increase my grip strength by 2kg at the end of this 12-week program (outcome goal), and I will do this by coming to both exercise classes each week (process goal).”

Goal Setting WORKSHEET

Use this page to write down a few goals and refer to them occasionally to remind you why you're working so hard. Don't forget to make them **Specific, Measurable, Attainable, Realistic, Timely and Together.**

Goal #1:

Benefits of the Change:

Action Steps:

1.

2.

3.

Goal #2:

Benefits of the Change:

Action Steps:

1.

2.

3.

Goal #3:

Benefits of the Change:

Action Steps:

1.

2.

3.

Key Point! Remember to evaluate your goals on a regular basis. Did you meet your goal? If you did, reward yourself and create a new and more challenging goal. If you didn't meet your goal, don't worry, it happens to the best of us...Re-adjust by asking What happened – was there a barrier that needs to be addressed? How can you adapt to meet your goal?

Behaviour Monitoring

Tracking your physical activity and exercise habits is important since it allows you to get instant feedback on previously set goals and increases your awareness of your progress.

While tracking your progress it is important to only make an observation without placing a value judgement on it, because otherwise it is easy to get discouraged. There are many options on how to effectively track your physical activity levels and in the end, it will come down to which option works best for you.

Potential Options:

1) Exercise Log or Diary (see attached below)

The advantage of a written exercise log or diary is that you have to make a concise effort and think about in which way you were physically active each day. The disadvantage is that they are usually a bit more work and can be tedious in the long run

2) Tracking Smart Phone App

These are easy to install and normally don't cost any extra money. They are simple way of tracking your step count and possible other physical activities (normally have to be entered manually). Most people own a smartphone, so this is any easy way to make a change.

Disadvantages to be aware of with these apps are potential privacy problems (who will receive your information) and they are less accurate than accelerometers, which are specifically designed to measure movement.

3) Smart Watch Activity Tracker

Smart watches get better and better in accurately capturing activity levels. Thus, they are great if you don't want to spend a large effort in tracking your physical activity levels but would still like to record them. However, these devices can be quite pricy especially the more high-class models (eg. Garmin, Polar, Fitbit, etc.).

Tracking your progress in the most convenient way for yourself and doing that continuously will make it a habit and feel less of a burden.

Example Exercise Log:

When filling out your diary, please keep in mind the following:

- Only count exercise session at least **10 minutes or longer** in duration.
- Only count exercise done in your free time (*not work or housework*).
- Only record exercise of moderate or strenuous intensity (*RPE between 3 and 6*).
- State your fatigue level post exercise (*0 = No fatigue and 10 = Severe fatigue, rest/nap needed*). (*Refer to the RPE scale and thermometers for this (both found in the ACE Maintenance package)*).
- *Please maintain this record on a regular basis*

WEEK	Exercise Type	Duration	Intensity (RPE)
1	Circuit training	60 min	5
WEEK	Exercise Type	Duration	Intensity (RPE)
2			

Barrier Management

There are all kinds of reasons why we're less active than we should be. Excuses some people might call them — but real or imagined, they may serve as obstacles to a more active life. The [Campbell Survey on Well-Being in Canada](#), conducted by the Canadian Fitness and Lifestyle Research Institute, found that the biggest perceived obstacles to physical activity are lack of time, lack of self-discipline, lack of a partner, and lack of ability.

Lack of Time

Some research now shows that leisure-time activity using as little as 500 extra calories a week have important health benefits. This doesn't require much time - a daily 15-minute walk, one 75-minute bike ride or two hours of gardening will do it! If you can't afford large chunks of time, aim for short bouts of activity spaced comfortably throughout your day. They all add up, so make good use of coffee breaks or lunch time as well as spare minutes around the house.

This doesn't mean that you shouldn't aim to meet or exceed the Canadian Physical Activity Guidelines (150 minutes of moderate or vigorous activity per week), but it is a good reminder that on those days where we really can't find the time to fit in a full workout, it is important to remember that we can still fit activity into our day.

Lack of Self-discipline

Many people start an activity program because it's good for them. The real secret is to find activities you enjoy. Do this, and you won't have to coax yourself to be active. You won't be governed by self-discipline alone.

Lack of a Partner

If self-discipline isn't a problem and you don't mind (or if you enjoy) being alone, then choose activities you can do by yourself. Find a practice wall and you can even play tennis or squash alone! But if you enjoy socializing, make sure your activities allow for it. Join a class or arrange your schedule so you can be active with a neighbour or a friend.

Lack of Ability

It is important to choose the right activity at the right level. If you are interested in trying a new activity, but don't feel like you have the knowledge or skills to do so, try taking a lesson. There are swimming classes, tennis lessons, learn-to-row sessions, and more. The choices are almost endless.

Planning Ahead

Many people have periods of inactivity. Sometimes these breaks can last a few days or sometimes much longer. Planning ahead for the ‘tough’ times may help you to stay active.

Have you ever had trouble maintaining an exercise program that you have previously started? If so, why?

If you have had difficulty previously, have certain behaviours or actions helped you to get back on track (i.e., joining a class, support from friends, setting goals)?

What situations do you think would make it tough to keep up your physical activity routine? How will you handle these situations to increase your chances of being successful?

What will help you get started again if you do have a break?

Social Support

Social support is an important ingredient in the behavioural change process. You are more likely to be successful if your family, friends, and co-workers are supportive than if they actively oppose, or are even indifferent to your efforts toward change. Social support can occur in many forms. It may be nothing more than encouragement and reinforcement of your attempts to change your habits.

Spouse or Partner Support

Your spouse or partner is likely to be one of the most significant people in your life. To gain support, try to include them in your change plan.

Children

Look for opportunities to play with children in your family. This opportunity also allows you time to chat with them and get to know more about them.

Friends or Neighbours

Some people find it easier to make exercise changes if they make a commitment to another person. Arrange to take your early morning walk with a neighbour, or meet a friend and walk to lunch.

Role Model for Exercise

We are influenced by those around us, especially by people we admire. Be realistic in choosing a physically active person as a role model - are they similar to you, at an activity level you inspire to reach, or doing an activity you want to try? Use your role model as motivation for staying active!

Your Support System

Who do you feel is providing you with social support?

Is there anybody who is discouraging you from participating in exercise?

How could you improve your support system?

Stress Management and Fatigue

This education session discusses the basic concept of stress and the role of exercise in stress reduction and cancer related fatigue. It also provides information on the importance of sleep and the mind-body connection.

WHAT IS STRESS?

*“The greatest weapon against stress is our ability to choose one thought over another.”
– William James*

Stress: A response characterized by psychophysiological tension experienced in the face of real and/or perceived challenges. Can be:

- External or Internal
- Distress (negative) or Eustress (positive)
- Both physical and psychological stressors can elicit a stress response

An *individual's perception* of the stressor is important and impacts the stress response.

- Primary Appraisal: Assessing the stressor as important yet potentially demanding.
- Secondary Appraisal: Assessing resources to deal with the stressor can lead to revisions of the primary appraisal. Do you have the resources to help you deal with the stressor?

EXERCISE, STRESS, & CANCER-RELATED FATIGUE

People report feeling less stress following an acute exercise bout and feeling less stressed in general when being physically active. If you are active, you may experience less of a stress response to a given stressor.

Cancer-related fatigue (CRF) is a common long-term symptom faced by cancer survivors and can increase patient stress. Evidence suggests that exercise can help manage CRF. Many forms of movement and exercise been found to decrease CRF.

RELAXATION

Relaxation: a state of relaxed attention to repetitive stimulus that reduces ‘inner dialogue’ (Benson, 1977). Relaxation counters the stress response and improves health, wellness, and quality of life.

Relaxation Benefits: (Elbe et al., 2007)

- Learn to pay attention to tension and relaxation

- Optimize and enhance recovery
- Encourage self-regulation (monitor and control one's own behaviour, emotions, and thoughts)

Relaxation Training: (McGrady, 2007):

- Relaxation training is a structured process that requires practice
- Relaxation techniques do not eliminate stress, but instead allow a person to learn to perceive situations differently and change their behavior during or after stress.
- All relaxation techniques include three components:
 - Passive attitude towards intruding thoughts
 - Repetition
 - Quiet and peaceful mind
- Examples:
 - Body scan
 - Progressive Muscle relaxation
 - Meditation
 - Yoga
 - Stretching
 - Self-hypnosis
 - Prayer
 - Music / Sound
 - Diaphragmatic breathing

MIND-BODY CONNECTION

Your body responds to the way you think, feel and act. This is often called the “mind-body connection.” When you are stressed, anxious, or upset, your body tries to tell you that something isn’t right. To help effectively manage stress, anxiety, depression, and pain, as well as some of the side effects of treatment, many survivors often use imagery and relaxation techniques.

What stress management techniques do you currently use? What techniques have you used in the past?

Have you ever tried imagery or relaxation? Would you consider trying a new method?

Adapting the Program

As you have seen, when you progress through an exercise program, your fitness levels will increase. In order to continue to improve your fitness levels, you must make sure that you continue to challenge yourself by adapting your exercise program to your changing fitness level.

To make your program more challenging, you can increase:

F FREQUENCY

Add an extra day of exercise to your week. Add a few more repetitions, or even another set to your resistance exercises.

I INTENSITY

Work a little harder than you have been. Increase the weight of your resistance exercises or add some jogging into your daily walks. Continue to challenge yourself but stay within the recommended intensity guidelines.

T TYPE

Switch around your exercises – try different exercises, move from resistance bands to dumbbells or start cycling instead of walking. Try a yoga or indoor cycling class. Variety!

T TIME

Increase the total amount of time of your average exercise session.

Key Point!

Use your goals as a guideline anytime you change your exercise program – target the aspects

Always Remember Your Safe Exercise Guidelines:

1. Wear appropriate clothing
2. Warm-up
3. Use proper breathing techniques (i.e., exhale during the “work or exertion” phase of any exercise)
4. Stay hydrated
5. Cool-down
6. Stretch following any exercise session
7. Rest between resistance training workouts
8. Soreness is normal post-exercise (pain is not – listen to your body).

Self-compassion

What is self-compassion?

Giving the same kindness to ourselves that we would give to others

The 3 elements of self-compassion:

1. Self-kindness vs. Self-judgment
 - Being warm and understanding towards short comings + difficult experiences
 - Treat yourself the way you would treat a close friend that is struggling
2. Common Humanity vs. Isolation
 - Suffering and personal inadequacy are part of the shared human experience
 - Being imperfect, failing, and experiencing life difficulties are inevitable
3. Mindfulness vs. Over-identification
 - Non-judgmental, receptive mind state in which one observes thoughts and feelings as they are
 - Bring attention to the present moment by:
 - o Focusing on the breath
 - o Noticing sensations of the soles of our feet
 - o Savouring the taste, smell, feeling from drinking a cup of tea
 - o Petting your cat/dog and focusing on the feeling of the fur

Practicing self-compassion

As you start to practice self-compassion, notice how the practice makes you feel. For some people, practicing self-compassion feels nice, relaxing and like a weight is lifted from their shoulders. For others, practicing self-compassion can actually feel quite uncomfortable. If we are used to pushing feelings away and then start to give ourselves permission to feel those feelings, this experience can be quite intense.

Dr. Kristen Neff, one of the leading experts in self-compassion, calls this experience backdraft. Backdraft is an analogy from firefighting where if you open a door in a burning house, oxygen will come rushing in and fire will burst out. In the same way, when you start opening your heart to love, and give yourself the time and space to feel emotions and experiences that you may have been pushing down or away for a long time, the pain within your heart may start to come out.

This experience of letting yourself feel these feelings may feel uncomfortable at first.

A strategy that may help is called “name it to tame it”. This approach involves giving yourself time to feel your feelings, and ‘name’ them as they come up. For example, as you feel anxious, angry, or happy acknowledge that feeling and name it. This approach will eventually allow you to be more mindful of your emotional state and acknowledge it without judgment.

You can practice self-compassion by clicking each of the exercises created by Dr. Kristin Neff:

1. How would you treat a friend?

- This exercise walks you through responding to yourself like you would to a good friend that is suffering

2. Self-compassion Break

- This exercise can be used throughout the day whenever you need a short break for yourself

3. Exploring self-compassion through writing

- Write a letter to yourself from a place of acknowledgement and compassion

4. Supportive touch

- This exercise will help you to feel calm, cared for, and safe

5. Changing your critical self-talk

- This exercise will enable you to change the way you relate to yourself

6. Self-compassion Journal

- This exercise will help make self-kindness, common humanity, and mindfulness part of your daily life

7. Identifying what we really want

- In this exercise you will learn how to reframe your inner dialogue to be more encouraging and supportive

8. Taking care of the caregiver

- By caring for yourself you are caring for and nurturing others

Self-Compassion Reflection Worksheet

When starting to practice self-compassion, you can use this sheet to reflect on your journey.

I am struggling with:

Self-compassion tools that can help me when I am feeling distressed:

- Taking a self-compassion break made me feel...
- Key words/phrases that help me during a self-compassion break...
- A journaling strategy that I use/will try is...

Resources:

www.self-compassion.org

https://centerformsc.org/course/category/msc_course_directory/

https://greatergood.berkeley.edu/article/item/21_ways_to_give_good_no

Sleep

Sleep disturbance is a common concern in cancer survivors. People with cancer can experience insomnia (difficulties falling or staying asleep) or hypersomnia (feeling excessively sleepy during the day). Sleep can be disturbed by leg restlessness, night sweats, needing to urinate often or even emotions such as anxiety. Sleep disturbance can also impact cancer-related fatigue (Davidson et al., 2002).

Strategies for good sleep hygiene:

1. Go to bed and get up at the same time every day (even on weekends)
2. Establish a relaxing bedtime routine/ritual
3. Limit daytime naps to 30 minutes
4. Avoid stimulants such as caffeine and nicotine close to bedtime
5. Consume alcohol in moderation (it disturbs sleep quality)
6. Exercise to promote good quality sleep (although some people should avoid strenuous workouts close to bedtime)
7. Ensure adequate exposure to natural light during the day
8. Avoid food that can be disruptive right before sleep
9. Avoid blue light exposure before bed (eg. laptop, phone, TV)
10. Avoid movies or computer/phone games right before bed
 - The overstimulation caused by such media might make it difficult to fall a sleep
 - Choose a good book instead
11. Evaluate your sleep environment: Is it cool, comfortable, dark and quiet?
12. Use your bed only for sleeping (not for work, movies, or time on your phone)

It can be overwhelming to incorporate all of these in your daily routine, but you don't have to. Start slow and pick a couple of changes that seem feasible to you and see how that goes.

How long is long enough?

The National Sleep Foundation established recommendations on the amount of sleep per night based on your age group:

- 19-25 years: 7-9h
 - 26-64 years: 7-9h
 - ≥ 65 years: 7-8h
- (Hirshkowitz et al., 2015)

A good start would be to aim for these hours and set your daily bed and wake time accordingly.

SLEEP WORKSHEET

This worksheet will help you solidify your sleep environment improvement.

My Bed-time is: : PM

My Wake-time is: : AM

That means I will be in bed by: : PM

Before going to bed my routine will be:

Additional Resources:

[Sleep is your Superpower](#) (by Matthew Walker)

Nutrition

Eating well is an important part of your cancer self-care. How you eat can affect your weight, strength, and energy. Good nutrition also promotes healing, supports immune function, and helps you feel your best.

Choose a varied and well-balanced way of eating.

Choose a variety of foods that provide the calories, protein, vitamins and minerals you need to stay well-nourished. Foods can be chosen based on your preferences, tolerances, appetite, any cancer or treatment side effects, as well as any other health conditions you have. The most helpful foods for you may be different than another persons. This is normal as there is not an “ideal diet”.

Strategies to help you eat well:

1. **Food Availability:** Have easy-to-prepare nutritious foods available for days when you are too tired or too busy to cook.
 - Examples are:
 - Whole grain bread,
 - Peanut butter,
 - Eggs,
 - Granola,
 - Protein bars,
 - Dried fruits
 - Nuts and seeds
2. **Meal Prepping:** When you can, make meals and freeze them for times when you don't feel like cooking.
3. **Enjoy Meals:** Make meals exciting by trying something new or sharing it with loved ones.
4. **Don't Skip Meals:** If your appetite is smaller than normal, snack throughout the day. Eating small amounts more often (5 or 6 times a day) may be easier than eating full meals.
5. **Aim for 8-12 cups of fluid each day:**
 - Strategies to implement:
 - Have a large water bottle with you
 - Set reminders to drink

How many calories can I eat to maintain my weight?

Your recommended daily calorie intake depends on your age, sex, height, weight, and physical activity level. To maintain your weight a simplified attempt is to match your daily caloric intake with your caloric outtake (calories burned per day). You can calculate your estimated daily calories burned [here](#). However, please keep in mind it matters which foods compose your daily calorie intake and not simply the calories itself.

Be careful with dietary supplements such as vitamins, minerals, herbal supplements and other natural health products.

Taking supplements to boost your immune system is not recommended and may not be safe. There are concerns that some supplements may affect how cancer treatments work. Therefore, during cancer treatment, do not take antioxidant supplements such as beta-carotene, vitamins A, C, and E, and selenium. However, you can continue to eat food sources of these nutrients. Eating food is the best way to get the vitamins and minerals your body needs to be healthy.

When you cannot eat a well-balanced diet, taking a one-a-day regular- strength multiple vitamin and mineral supplement may be helpful. Speak with your health care provider before you take a vitamin, mineral or natural health product supplement if you are having cancer treatment.

Additional Resources:

Canada's Food Guide: <https://food-guide.canada.ca>

Recipes To Help You Get Enough Calories & Protein: [Here](#)

Canadian Cancer Society: www.cancer.ca

American Institute of Cancer Research: www.aicr.org

Self-Reflection

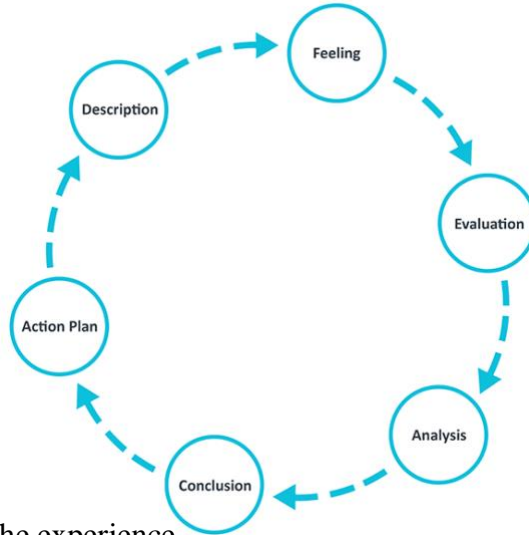
It is important to set goals and work towards accomplishing them. However, celebrating your accomplishments and reevaluating your progress are at least as important.

“Sometimes, you have to look back in order to understand the things that lie ahead”

-Yvonne Woon

Gibbs’ Reflection Cycle (Gibbs, 1988):

Gibb’s Reflection Cycle is a good reflection tool that can help you learn from any past experience of behaviour that you’re currently working on.



University of Edinburgh, 2020

1. Description of the experience
 - What happened?
 - What was the outcome?
2. Feelings and Thoughts
 - How did you feel during the experience?
 - What do you think about the situation now?
3. Evaluation (good and bad)
 - What are you proud of?
 - Where do you want to continue to improve?
4. Analysis
 - Why did I reach my goals?
5. Conclusion
 - What did I learn?
6. Action Plan
 - How can I apply my lessons in the future?

Self-Reflection Worksheet

Here you can use Gibb's reflection framework to reflect on an important topic in your life.

I want to reflect on _____

Description:

Feelings & Thoughts:

Evaluation:

Analysis:

Conclusion:

Action Plan:

Health and Media

The media is also constantly bombarding us with “Get Fit Quick” schemes. Many of these pills, shakes, and plans are scientifically unfounded. Although they may empty your pocketbook quickly, and perhaps even take unwanted pounds off quickly, it is unlikely that the results will last. Being an informed consumer is vital in today’s market. The following are some tips to take into consideration:

1. Who is providing the information? Is it coming from an expert in the field or is the information given by testimonials?
2. Where did the information come from? Are the researchers affiliated with universities, research hospitals, or governmental agencies?
3. Are there other studies with the same/similar results, or other products using the same ingredients? Dramatic breakthroughs are rare in science.
4. Is the product accepted by a governing body (i.e., Health Canada, FDA?)
5. Is the product designed for a specific population (i.e., children, obese, diabetics)?

The bottom line is...health eating and regular physical activity should be about maintaining a healthy lifestyle long-term!

Remote Resources

(will be updated closer to providing the material due to rapid changes with COVID-19)



The ACE website offers many remote resources to access for free. More information can be found [here](#).



Wellspring offers remote courses for cancer survivors. More information can be found [here](#).

Maintaining Motivation

Being active out of a sense of guilt or obligation or just to look good is a sure recipe for failure. According to research by Luc Pelletier and colleagues from University of Ottawa, the greatest sources of motivation are in doing something for:

1. Fun, enjoyment, stimulation
2. A feeling of accomplishment
3. The pleasure of learning
4. A well-identified benefit such as sleeping better and feeling calmer

So, pursue an activity you enjoy! For a feeling of accomplishment, pursue an activity you know you can do. When you succeed, you feel competent and your motivation increases. If you enjoy learning, try a new activity or build new skills. Whatever benefits you seek — companionship, a feeling of well-being, heart health — match them with a physical activity that can provide these benefits.

Above all, make it convenient to be active. Many activities are accessible right from your front door — walking, running, jogging, in-line skating, cycling... Take every opportunity to be active: walk for short errands or during your lunch hour. If you can't afford large chunks of time, try spacing a few short bouts throughout the day. Get yourself into a roll, and the benefits will start accumulating, right on cue!

Your Inspiration

What is your motivation for exercise?

Who is the greatest motivator in your life? _____

How are you similar to/different from that person?

Exercise has helped me....

- | | | |
|---|---|---------------------------------------|
| <input type="checkbox"/> Feel better | <input type="checkbox"/> Feel healthier | <input type="checkbox"/> Feel strong |
| <input type="checkbox"/> Have more energy | <input type="checkbox"/> Feel better about myself | <input type="checkbox"/> Have fun |
| <input type="checkbox"/> Manage stress better | <input type="checkbox"/> Work without tiring easily | <input type="checkbox"/> Look better |
| <input type="checkbox"/> Manage my weight | <input type="checkbox"/> Give me more confidence | <input type="checkbox"/> Sleep better |

Other benefits you've experienced with exercise so far:

Motivate Yourself

Do focus on enjoying the experience – the movement, the surroundings, the company (or the breathing space).

Do monitor your physical responses in a relaxed manner. See how your response to exercise changes as you continue throughout the program.

Don't push yourself too hard. You may rob yourself of the feeling of enjoyment you need to be regularly active.

Don't "should" yourself! Instead of saying "I should exercise," say "It would be better for me if I went for a walk today because I could use some fresh air."

Do engage in physical activity to reward yourself. Enjoy physical activity because it improves your mood, reduces your anxiety and helps you to relax.

APPENDIX D: HEALTH COACHING FIDELITY FORM

Health Coaching Protocol Evaluation

1st WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate
- Short education on **Goal Setting**
 - Importance: provides guidance and mindfulness
 - Setting SMART² goals
 - **Specific:** What exactly do you want to accomplish? Where? When? Why? How much?
 - **Measurable:** Are you able to assess your progress?
 - **Attainable:** Is your goal within your reach given your current situation?
 - **Realistic:** Are you both willing and able to work towards your goal?
 - **Timely:** What is the deadline for completing your goal?
 - **Together:** Who is supporting you to be active?
 - Important to consider:
 - Set long-term and short-term goals

- Challenge yourself
- Focus on the process
- Re-evaluate your progress and goals frequently
- Participant questions:
 - Do you have any goals already?
 - If not, think of your goals over the next week
- If participant would like to have more information: pg. 8

Comment:

4.) Accountability plan (Time spent: _____) •

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____) •

- Positive outlook

Comment:

2nd WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

13) Short education on **Monitoring Behaviour**

- Importance: Allows for instant feedback on previously set goals, elevates awareness
- Options:
 - Exercise Log/Diary
 - Smart watch
 - Tracking App
 - Simply taking some time at night to think about accomplishments
- Important to consider:
 - Don't evaluate only observe
 - Make it a continuous habit
- Participant questions:
 - Are you using anything already to track PA levels?
 - How often?
 - Which method of tracking would you prefer?
- If participant would like to have more information: pg. 11

Comment:

4.) Accountability plan (Time spent: _____)

•

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____) •

- Positive outlook

Comment:

3rd WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

14) Short education on **Barrier Management**

- Importance: Planning for barriers may help you cope with them better
- 9 most common Barriers in CS:
 - Lack of Self discipline
 - Fatigue
 - Lack of Time
 - Exercise not a Priority
 - Lack of enjoyment
 - Lack of interest
 - Lack of encouragement
 - Bad weather
 - Tired
- Make dependent on individual's barriers
- Participant Questions:
 - Which barriers do you anticipate?
 - What is the most common reason for you not to exercise?
- If participant would like to have more information: pg. 13

Comment:

4.) Accountability plan (Time spent: _____)

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

•

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____)

- Positive outlook

•

Comment:

4th WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

15) Short education on **Social Support**

- Importance: Is a crucial piece in supporting long lasting behaviour change
- Can be in many forms:
 - Family members
 - Friends
 - Even Dogs
- Be participant specific ask about their loved ones (with names) let them guide the conversation
 - Does ... support you to stay active
 - How? Are they exercising with you?
 - What would you like to change?
- If participant would like to have more information: pg. 17

Comment:

4.) Accountability plan (Time spent: _____)

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____)

- Positive outlook

Comment:

5th WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

16) Short education on **Stress Management**

- Importance: Coping mechanisms
- Eustress vs Distress
- Relaxation training
 - Structured process that requires practice
- Examples:
 - Body scan
 - Progressive Muscle relaxation
 - Meditation
 - Yoga
 - Stretching
 - Self-hypnosis
 - Prayer
 - Music / Sound
 - Diaphragmatic breathing
- Mind Body Connection

- Participant question:
 - Have you tried these techniques?
 - Awareness of Body/Mind state?
- If participant would like to have more information: pg. 22

Comment:

4.) Accountability plan (Time spent: _____)

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

•

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____)

- Positive outlook

•

Comment:

6th WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

17) Short education on **Adapting the Program**

- Importance: Variation makes exercise more exciting and providing different stimuli for your muscles is actually beneficial
- Possible opportunities for adapting your program (FITT- Principle)
 - **FREQUENCY**
Add an extra day of exercise to your week. Add a few more repetitions, or even another set to your resistance exercises.
 - **INTENSITY**
Work a little harder than you have been. Increase the weight of your resistance exercises or add some jogging into your daily walks. Continue to challenge yourself but stay within the recommended intensity guidelines.
 - **TYPE**
Switch around your exercises – try different exercises, move from resistance bands to dumbbells or start cycling instead of walking. Try a yoga or indoor cycling class. Variety!

- **TIME**
Increase the total amount of time of your average exercise session.
- Participant Question:
 - Have you already tried adapting the home program?
- Potentially explain how varying the home program works
 - Exercise Appendix
 - Recommended options behind each Exercise
- If participant would like to have more information: pg. 15

Comment:

4.) Accountability plan (Time spent: _____) •

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____) •

- Positive outlook

Comment:

7th WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate
- Short education on **Self-Compassion**
 - Importance: Key to treating yourself healthy
 - Giving same kindness to ourselves that we would give to others
 - 3 Elements:
 - Self-kindness vs Self-judgment
 - Common Humanity vs. Isolation
 - Mindfulness vs Over-identification
 - Strategies:
 - Breathing
 - Petting a pet
 - Cup of tea
 - Participant question:
 - Friend is struggling. How would you respond?
 - You're struggling. How do you respond to yourself?
 - Differences Similarities?

Comment:

4.) Accountability plan (Time spent: _____)

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

•

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____)

- Positive outlook

•

Comment:

8th WEEK (A)

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate
- Short education on **Sleep**
 - Importance: Sleep helps us recover and rebuild physically and mentally
 - Focus:
 - Routine
 - Length
 - Conditions
 - Strategies
 - Participant questions:
 - What is your daily routine?
 - What do you do before you go to bed?
 - What would be your ideal length? When do you feel most rested?

Comment:

4.) Accountability plan (Time spent: _____) •

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____) •

- Positive outlook

Comment:

8th WEEK (B)

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate
- Short education on **Nutrition**
 - Importance: Can affect weight, strength, and energy
 - Focus:
 - Balanced meals
 - Fresh
 - Calories
 - Caution with supplements
 - Drinking enough
 - Participant questions:
 - What are your eating habits? Time? Place? Together?
 - What are things you would want to change and why?
 - Strategies? Meal prepping? Grocery list? Big water bottle?

Comment:

4.) Accountability plan (Time spent: _____)

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____)

- Positive outlook

Comment:

9th WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

18) Short education on **Reflection**

- Importance: We often want to strive for more but seldom take the time to celebrate how far we've come
- Focus:
 - Gibb's Reflection cycle
 - Learning from past successes and failures
 - Readjusting your goals
- Participant questions:
 - What are you proud of?
 - Where do you see yourself on the journey to your previously established goals?
 - What are ways in which you can readjust or build upon your goals?

Comment:

4.) Accountability plan (Time spent: _____) •

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____) •

- Positive outlook

Comment:

10th WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

19) Short education on **Health Media**

- Importance: There is a lot of information online but a lot of it is also wrong or unsafe for you → creating awareness of which information is reliable
- Consider:
 - Reliable sources:
 - Government designation or degree
 - Certified Exercise Physiologist (CEP)
 - Registered Dietitian (RD)
 - Does the person claiming something use peer-reviewed references?
 - Questionable sources:
 - Nutritionist
 - Don't need certificate or even degree
 - Any radical breakthrough results
 - Social media adds
 - Are the sources cancer specific?

- Don't hesitate to ask any of our CEPs about information you found online
- If participant would like to have more information: pg. 16

Comment:

4.) Accountability plan (Time spent: _____)

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

•

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____) •

- Positive outlook

Comment:

11th WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

20) Short education on **Remote Resources**

- ACE maintenance package with video future
- Wellspring offers remote programs
 - o @ <https://wel.gametime.net/auth>
- Any other cancer specific remote resources?
- Ask participant questions about experience with these
 - o Did you try any of them?
 - o What were your thoughts?
- If participant would like to have more information: pg. 18

Comment:

4.) Accountability plan (Time spent: _____)

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____)

- Positive outlook

Comment:

12th WEEK

Covered:

1.) Chat about current situation (Time spent: _____)

- Listen
- Participant focus

Comment:

2.) Process evaluation (Time spent: _____)

- How are you doing? Energy?
- How much PA last week?
- How did the exercises go?
- Any barriers
- Highlight or favourite exercise of last week

Comment:

3.) Set / Update Goals (self-determined) (Time spent: _____)

- Led by participant whatever they think is achievable
 - Tailor to individual (before) → use as options in the end led by participant
- Motivate

21) Short education on Maintaining Motivation & Remote Resources

- Importance: key tool required to achieve lifelong fitness
- Key sources of motivation
 - Fun, enjoyment, stimulation
 - A feeling of accomplishment (Meaningfulness)
 - The pleasure of learning
 - A well-identified benefit such as sleeping better and feeling calmer
- Aim to fuel these sources by
 - Being mindful
 - While Exercising
 - While making healthy life choices
 - Setting Goals/ Making it meaningful
 - Monitoring your process
- Participant question:
 - What motivates you to keep exercising?
- If participant would like to have more information: pg. 19

Comment:

4.) Accountability plan (Time spent: _____)

- Establish potential barriers
- Discuss options of overcoming these
 - List of potential actions
- Develop a strategy plan

•

Comment:

5.) Summarize Goals & Overcoming barrier strategies (Time spent: _____)

- Positive outlook

•

Comment:

APPENDIX E: CLASS FIDELITY FORM

Class Protocol Fidelity Checklist

Class:

Week:

Instructor:

	Yes	No	Comment
Alterations to pre-class			
Alterations to warm up			
Alterations to circuits			
Alterations to cool-down			
Alterations to post-class conversation			
Late participant			
Technical difficulties			
Audio/Video			
Logging in			

Additional notes:

--

APPENDIX F: INTERVIEW GUIDE

Semi-Structured Interviews Protocol

Welcome:

Hi _____. Thank you for participating in today's interview. Before we get started with the interview portion, I will provide you with some details.

The interview today will focus on your experiences during the 12-week remote exercise maintenance program. The interview will be recorded and saved on a secure server at the University of Calgary. None of the information you provide today will be connected to you personally, but only to a study ID. The interview should take about 30 minutes and should you need a break, we can pause at any time. You can choose to withdraw at any point or choose to not answer a question if you don't feel comfortable. Please keep in mind that there are no right or wrong answers and we encourage you to tell us about your experience freely. Do you have any questions? Ready? I will start the recording now.

None-HC Participants

1. Can you tell me, overall, about your experience with the recently completed ACE remote maintenance program?

Probes:

- *And why do you say that?*
- *Can you think of a specific example?*

2. (If not mentioned before) As you probably recall, the first two weeks of the program classes were offered twice a week and the following weeks classes were once a week. What do you think about that structure?

Probes:

- *Why do you prefer once a week/ twice a week? (Benefits of preference)*
- *What are your thoughts on the length (1h) of the classes?*

Now I'd like to ask about some of the specific components of the program

3. First – you completed questionnaires and a physical functioning testing before and after the study. What were your perceptions of the questionnaires?

Probes:

- *Length?*
- *Did you find the questionnaire addressed things about your experience that were important to you?*
- *Were there other things we should have asked?*

What were your perceptions of the physical functioning assessment?

- *Safety?*
- *Comprehensive?*

4. What was your experience with the Garmin activity tracker?

Probes:

- *Useful?*
- *Which functions did you use?*
- *How user friendly was the device?*
- *Accuracy?*
- *Comfort and Ascetics?*

5. How would you compare your remote class experience to your in-person class experience?

Probes:

- *Interaction with instructor? Other Participants?*
 - *Post class session*
- *Perception of Safety and proper technique?*
- *Pros/Cons?*

6. What, if anything, within this program may have prepared you to stay active in the future?

Probes:

- *Did the class have an effect on your confidence to overcome barriers to exercise?*

This is the end of the interview. Thank you for participating in the interview and the study in general. Don't hesitate to contact me in case you have any questions or concerns.

HC Participants

1. Can you tell me, overall, about your experience with the recently completed ACE remote maintenance program?

Probes:

- *And why do you say that?*
- *Can you think of a specific example?*

2. (If not mentioned before) As you probably recall, the first two weeks of the program classes were offered twice a week and the following weeks had classes once a week. What do you think about that structure?

Probes:

- *Why do you prefer once a week/ twice a week? (Benefits of preference)*
- *What are your thoughts on the length (1h) of the classes?*

Now I'd like to ask about some of the specific components of the program

3. First – you completed questionnaires and a physical functioning testing before and after the study. What were your perceptions of the questionnaire?

Probes:

- *Length?*
- *Did you find the questionnaire addressed things about your experience that were important to you?*
- *Were there other things we should have asked?*

What were your perceptions of the physical functioning assessment?

- *Safety?*
- *Comprehensive?*

4. What was your experience with the Garmin activity tracker?

Probes:

- *Useful?*
- *Which functions did you use?*
- *How user friendly was the device?*
- *Accuracy?*
- *Comfort and Ascetics?*

5. Could you please comment on your experience with health coaching?

Probes:

- *Helpful?*
- *Dose?*
- *What was your experience with the Coach you were matched with like?*
- *Recommendations?*
- *Educational topics?*

6. How would you compare your remote class experience to your in-person class experience?

Probes:

- *Interaction with instructor? Other Participants?*
 - *Post class session*
- *Perception of Safety and proper technique?*
- *Pros/Cons?*

7. What, if anything, within this program may have prepared you to stay active in the future?

Probes:

- *Did the class have an effect on your confidence to overcome barriers to exercise?*

This is the end of the interview. Thank you for participating in the interview and the study in general. Don't hesitate to contact me in case you have any questions

APPENDIX G: QUESTIONNAIRE BATTERY

Remote Alberta Cancer Exercise (ACE) Maintenance Patient Reported Outcomes

Legend

Barrier- Self-Efficacy Scale	pg 3
FACT-G.....	pg 4
FACIT-F.....	pg 6
Oslo Social Support Scale	pg 7
UCLA Loneliness Scale (short form)	pg 8
Perceived Stress Scale	pg 9
Modified Godin Leisure Time Exercise Questionnaire	pg 10

Barrier Self-Efficacy Scale

Please answer all questions below by circling the most appropriate option.

How confident do you feel to exercise in the following scenarios?

(Rate yourself from 0-100% where: 0-20% = no at all confident; 20-40% = slightly confident; 40-60% = moderately confident; 60-80% = very confident; 80-100% = extremely confident)

When you lack discipline to exercise	0	10	20	30	40	50	60	70	80	90	100
When you are nauseated	0	10	20	30	40	50	60	70	80	90	100
When exercise is not a priority	0	10	20	30	40	50	60	70	80	90	100
When the weather is bad	0	10	20	30	40	50	60	70	80	90	100
When you are tired	0	10	20	30	40	50	60	70	80	90	100
When you are not interested in exercising	0	10	20	30	40	50	60	70	80	90	100
When you lack time	0	10	20	30	40	50	60	70	80	90	100
When you do not enjoy exercising	0	10	20	30	40	50	60	70	80	90	100
When you do not have someone to encourage you to exercise	0	10	20	30	40	50	60	70	80	90	100

By Rogers et al., 2006

FACT-G (Version 4)

Below is a list of statements that other people with your illness have said are important. Please circle or mark one number per line to indicate your response as it applies to the past 7 days.

PHYSICAL WELL-BEING

		Not at all	A little bit	Some -what	Quite a bit	Very much
GP1	I have a lack of energy	0	1	2	3	4
GP2	I have nausea	0	1	2	3	4
GP3	Because of my physical condition, I have trouble meeting the needs of my family	0	1	2	3	4
GP4	I have pain	0	1	2	3	4
GP5	I am bothered by side effects of treatment	0	1	2	3	4
GP6	I feel ill	0	1	2	3	4
GP7	I am forced to spend time in bed	0	1	2	3	4

SOCIAL/FAMILY WELL-BEING

		Not at all	A little bit	Some -what	Quite a bit	Very much
GS1	I feel close to my friends	0	1	2	3	4
GS2	I get emotional support from my family.....	0	1	2	3	4
GS3	I get support from my friends	0	1	2	3	4
GS4	My family has accepted my illness	0	1	2	3	4
GS5	I am satisfied with family communication about my illness	0	1	2	3	4
GS6	I feel close to my partner (or the person who is my main support).....	0	1	2	3	4
Q1	<i>Regardless of your current level of sexual activity, please answer the following question. If you prefer not to answer it, please mark this box <input type="checkbox"/> and go to the next section.</i>					
GS7	I am satisfied with my sex life.....	0	1	2	3	4

Please circle or mark one number per line to indicate your response as it applies to the past 7 days.

EMOTIONAL WELL-BEING

		Not at all	A little bit	Some- what	Quite a bit	Very much
GE1	I feel sad	0	1	2	3	4
GE2	I am satisfied with how I am coping with my illness.....	0	1	2	3	4

GE3	I am losing hope in the fight against my illness.....	0	1	2	3	4
GE4	I feel nervous.....	0	1	2	3	4
GE5	I worry about dying.....	0	1	2	3	4
GE6	I worry that my condition will get worse.....	0	1	2	3	4

FUNCTIONAL WELL-BEING

		Not at all	A little bit	Some- what	Quite a bit	Very much
GF1	I am able to work (include work at home)	0	1	2	3	4
GF2	My work (include work at home) is fulfilling	0	1	2	3	4
GF3	I am able to enjoy life	0	1	2	3	4
GF4	I have accepted my illness	0	1	2	3	4
GF5	I am sleeping well.....	0	1	2	3	4
GF6	I am enjoying the things I usually do for fun	0	1	2	3	4
GF7	I am content with the quality of my life right now	0	1	2	3	4

FACIT-F (Version 4)

Below is a list of statements that other people with your illness have said are important. Please circle or mark one number per line to indicate your response as it applies to the past 7 days.

		Not at all	A little bit	Some- what	Quite a bit	Very much
HI7	I feel fatigued	0	1	2	3	4
HI12	I feel weak all over	0	1	2	3	4
An1	I feel listless ("washed out")	0	1	2	3	4
An2	I feel tired	0	1	2	3	4
An3	I have trouble <u>starting</u> things because I am tired	0	1	2	3	4
An4	I have trouble <u>finishing</u> things because I am tired.....	0	1	2	3	4
An5	I have energy.....	0	1	2	3	4
An7	I am able to do my usual activities.....	0	1	2	3	4
An8	I need to sleep during the day	0	1	2	3	4
An12	I am too tired to eat	0	1	2	3	4
An14	I need help doing my usual activities.....	0	1	2	3	4
An15	I am frustrated by being too tired to do the things I want to do	0	1	2	3	4
An16	I have to limit my social activity because I am tired	0	1	2	3	4

Oslo Social Support Scale (OSSS-3)

Please answer all questions below by circling the most appropriate option.

Oslo 1: How many people are so close to you that you can count on them if you have great personal problems?

(1) 'none'

(2) '1-2'

(3) '3-5'

(4) '5+'

Oslo 2: How much interest and concern do people show in what you do?

(1) 'none'

(2) 'little'

(3) 'uncertain'

(4) 'some'

(5) 'a lot'

Oslo 3: How easy is it to get practical help from neighbors if you should need it?

(1) 'very difficult'

(2) 'difficult'

(3) 'possible'

(4) 'easy'

(5) 'very easy'

UCLA Loneliness Scale Short Version (ULS-6)

Please answer all questions below by circling the most appropriate option.

1. I lack companionship

1 (never) 2 (rarely) 3 (sometimes) 4 (always)

2. I feel part of a group of friends

1 (never) 2 (rarely) 3 (sometimes) 4 (always)

3. I feel left out

1 (never) 2 (rarely) 3 (sometimes) 4 (always)

4. I feel isolated from others

1 (never) 2 (rarely) 3 (sometimes) 4 (always)

5. I am unhappy being so withdrawn

1 (never) 2 (rarely) 3 (sometimes) 4 (always)

6. People are around me but not with me

1 (never) 2 (rarely) 3 (sometimes) 4 (always)

Perceived Stress Scale (PSS)

Please answer all questions below by circling the most appropriate option.

1. In the last month, how often have you been upset because of something that happened unexpectedly?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

2. In the last month, how often have you felt that you were unable to control the important things in your life?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

3. In the last month, how often have you felt nervous and stressed?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

5. In the last month, how often have you felt that things were going your way?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

7. In the last month, how often have you been able to control irritations in your life?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

8. In the last month, how often have you felt that you were on top of things?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

9. In the last month, how often have you been angered because of things that happened that were outside of your control?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

0 (never) 1 (almost never) 2 (sometimes) 3 (fairly often) 4 (very often)

Modified Godin Leisure Time Exercise Questionnaire (mGLTEQ)

We would like you to recall your average weekly exercise over the past month. How many times per week on average did you do the following kinds of exercise over the past month?

When answering these questions please remember to:

Consider your average weekly exercise over the past month

Only count exercise sessions that lasted 15 minutes or longer in duration

Only count exercise that was done during free time (i.e. do not include occupation or housework) Note the main difference between the three categories is the intensity of the exercise

Write the average frequency on the first line and the average duration on the second line

STRENUOUS EXERCISE (Heart beats rapidly, sweating)

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

In an average week I was involved in strenuous exercise _____ times/week for an average duration of _____ minutes/each session.

MODERATE EXERCISE (Not exhausting, light perspiration)

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

In an average week I was involved in moderate exercise _____ times/week for an average duration of _____ minutes/each session.

MILD EXERCISE (Minimal effort, no perspiration)

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

In an average week I was involved in mild exercise _____ times/week for an average duration of _____ minutes/each session.

RESISTANCE TRAINING EXERCISE

(e.g. exercises with dumbbells, body weight, bands, such as squats, bicep curls, etc.)

In an average week I perform resistance training activities _____ times/ week for an average duration of _____ minutes/session.

FLEXIBILITY TRAINING EXERCISE

(e.g. yoga, stretching)

In an average week I perform flexibility training activities _____ times/ week for an average duration of _____ minutes/session.

APPENDIX H: MCID TABLE

Table 13. Minimal Clinically Important Difference Table

Outcome Measure	Minimal Clinically Important Difference (MCID)	Reference
FACT-G	3 Points	McNeely, M. L., Sellar, C., Williamson, T., Gobeil, E., Joy, A. A., & Culos-Reed, S. N. (2020). Community-based Exercise For Health Promotion And Secondary Cancer Prevention: A Hybrid Effectiveness-implementation Study: 1981 Board# 6 May 28 3: 45 PM-5: 45 PM. <i>Medicine & Science in Sports & Exercise</i> , 52(7S), 523.
FACIT-F	3 Points	McNeely, M. L., Sellar, C., Williamson, T., Gobeil, E., Joy, A. A., & Culos-Reed, S. N. (2020). Community-based Exercise For Health Promotion And Secondary Cancer Prevention: A Hybrid Effectiveness-implementation Study: 1981 Board# 6 May 28 3: 45 PM-5: 45 PM. <i>Medicine & Science in Sports & Exercise</i> , 52(7S), 523.
Single leg balance (eyes open)	24 seconds	Goldberg, A., Casby, A., & Wasielewski, M. (2011). Minimum detectable change for single-leg-stance-time in older adults. <i>Gait & posture</i> , 33(4), 737-739.
Shoulder Range of Motion	>10°	Muir, S. W., Corea, C. L., & Beaupre, L. (2010). Evaluating change in clinical status: reliability and measures of agreement for the assessment of glenohumeral range of motion. <i>North American journal of sports physical therapy: NAJSPT</i> , 5(3), 98.
Moderate to vigorous physical activity (MVPA) minutes	26 minutes/week	Hur, S. A., Guler, S. A., Khalil, N., Camp, P. G., Guenette, J. A., Swigris, J. J., & Ryerson, C. J. (2019). Minimal important difference for physical activity and validity of the International Physical Activity Questionnaire in interstitial lung disease. <i>Annals of the American Thoracic Society</i> , 16(1), 107-115.
Sit to Stand	2.6 repetitions	Wright, A. A., Cook, C. E., Baxter, G. D., Dockerty, J. D., & Abbott, J. H. (2011). A comparison of 3 methodological approaches to defining major clinically important improvement of 4 performance measures in patients with hip osteoarthritis. <i>Journal of orthopaedic & sports physical therapy</i> , 41(5), 319-327.
Perceived Stress Scale (PSS-10)	2.66 points	Drachev, S. N., Stangvaltaite-Mouhat, L., Bolstad, N. L., Johnsen, J.-A. K., Yushmanova, T. N., & Trovik, T. A. (2020). Perceived stress and associated factors in Russian medical and dental students: A cross-sectional study in North-West Russia. <i>International journal of environmental research and public health</i> , 17(15), 5390.

APPENDIX I: APPENDIX I: 8-WEEK WAVE RESULTS

Table 14. Objective MVPA Minutes per Week and the Percentage of Participants meeting the Exercise Guidelines in the 8-Week Wave

Week	Non-HC			HC			Total
	Research Algorithm MVPA min/week	Garmin* Algorithm MVPA min/week	Percentage of Participants Meeting Exercise Guidelines	Research Algorithm MVPA min/week	Garmin* Algorithm MVPA min/week	Percentage of Participants Meeting Exercise Guidelines	Percentage of Participants Meeting Exercise Guidelines
Week 5	1092.3 ±1305.9	165.7 ± 301.9	33.3%	925.2 ± 567.2	219.2 ± 318.5	60.0%	47.4%
Week 6	1395.6 ± 1591.6	328.0 ± 524.9	70.0%	965.5 ± 898.1	167.2 ± 167.3	60.0%	65.0%
Week 7	1119.6 ± 1348.1	229.7 ± 428.4	33.3%	1075.7 ± 796.0	168.2 ± 196.3	63.6%	50.0%
Week 8	852.1 ± 816.4	180.4 ± 177.3	57.1%	1059.8 ± 575.2	224.2 ± 207.6	75.0%	66.7%
Total			48.6%			64.1%	56.8%

*Imputed as described in Chapter 5

Percentages of participants meeting the exercise guidelines per week is calculated based on the imputed Garmin algorithm's data

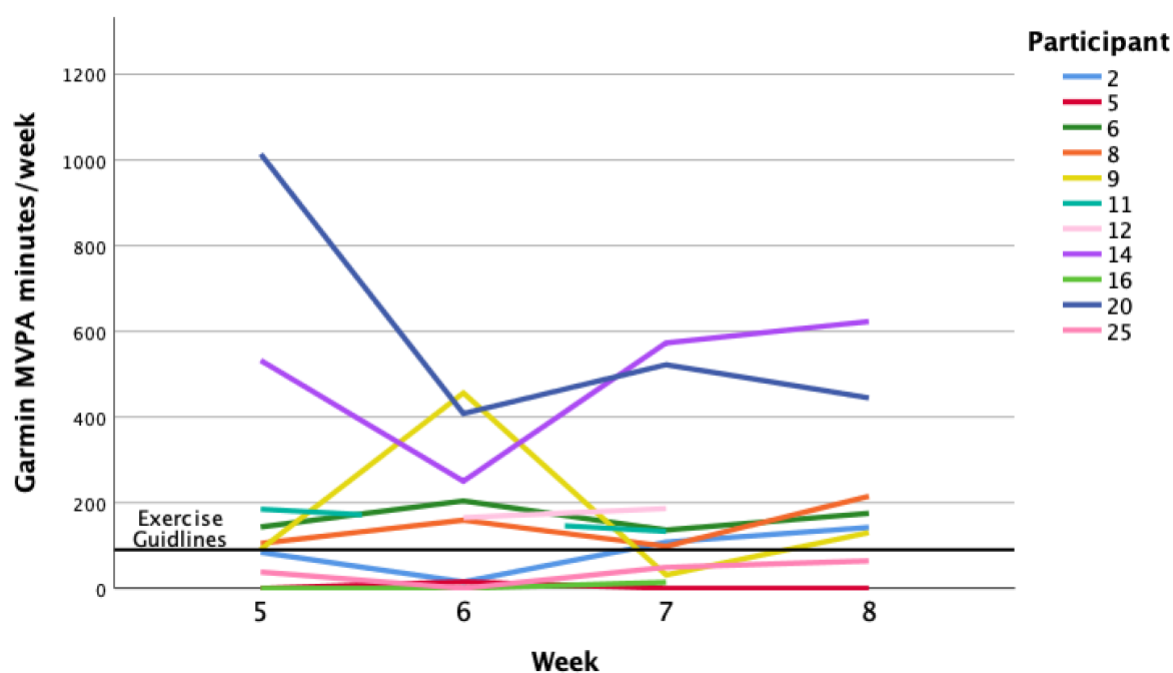


Figure 13. Individual Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the Health Coaching Group During the 8-Week Wave as Measured by the Imputed Garmin Vivosmart4 Data

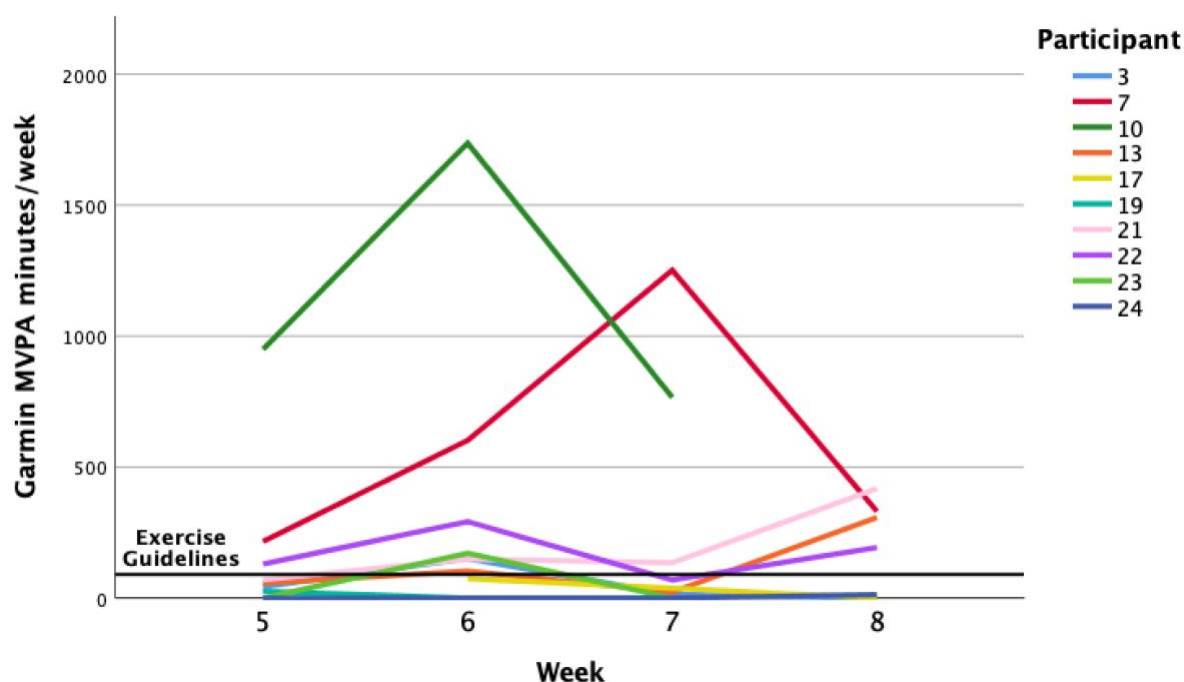


Figure 14. Individual Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the non-Health Coaching Group During the 8-Week Wave as Measured by the Imputed Garmin Vivosmart4 Data

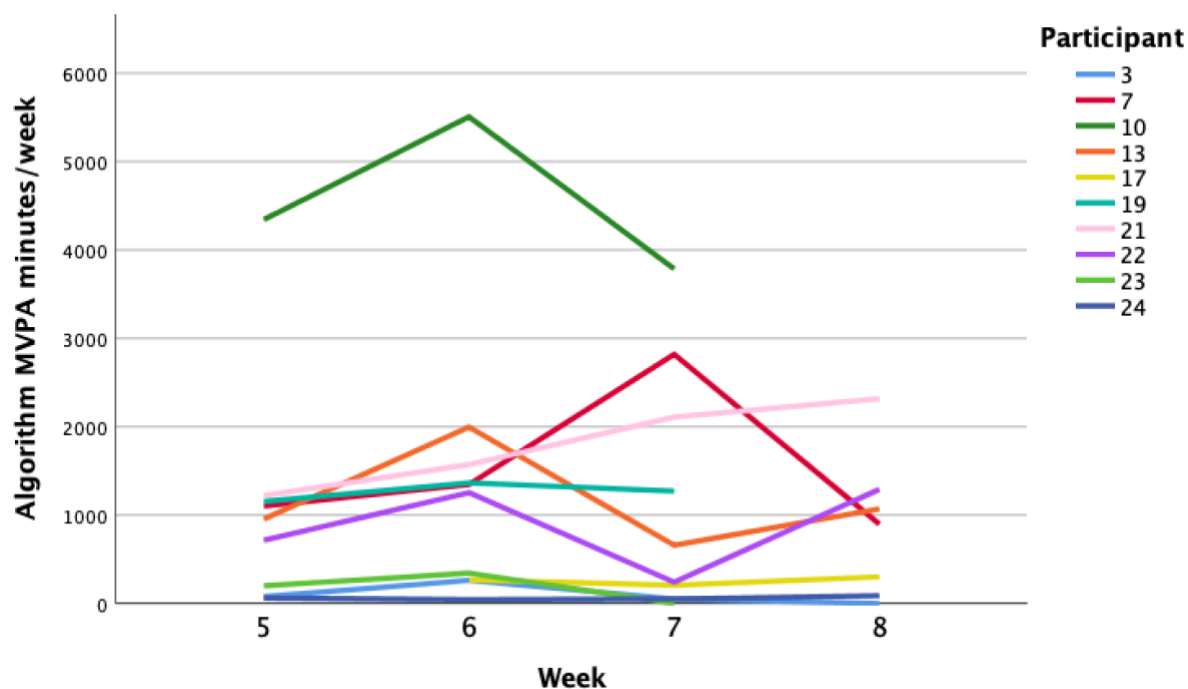


Figure 15. Individual Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the non-Health Coaching Group During the 8-Week Wave as Measured by the Imputed Algorithm

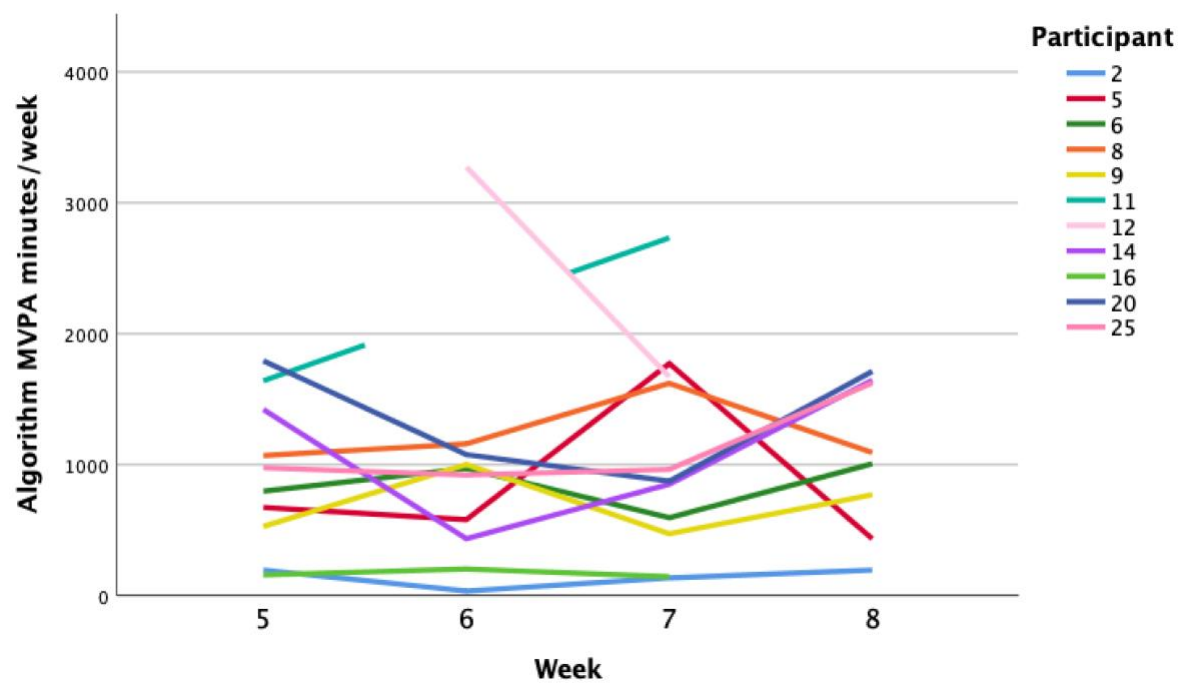


Figure 16. Individual Moderate to Vigorous Physical Activity (MVPA) Minutes per Week for the Health Coaching Group During the 8-Week Wave as Measured by the Imputed Algorithm

Table 15. Baseline to Post-intervention Differences for the non-HC Intervention Group in the 8-week Wave

	Baseline: Mean \pm SD Median (IQR)	8WK Mean \pm SD Median (IQR)	Mean \pm SD / Median (IQR) Difference	g	95% CI
FACT-G	78.3 \pm 8.7	80.8 \pm 7.3	1.17 \pm 5.31	0.31	-4.18 – 9.18
FACIT-F	36.8 \pm 5.2	35.6 \pm 12.1	-1.08 \pm 9.61	0.13	-8.80 – 6.40
Barrier SE	46.00 (26.00)	38.50 (35.00)	-5.50 (28.0)	0.24	-32.87 – 17.87
OSSS-3	11.1 \pm 2.4	10.8 \pm 2.3	-0.50 \pm 1.62	0.13	-2.25 – 1.65
PSS	15.0 (10.0)	14.5 (11.5)	-1.08 \pm 4.44	0.05	-9.40 – 8.40
ULS-6	13.2 \pm 3.9	13.9 \pm 2.8	1.08 \pm 2.87	0.20	-2.13 – 3.53
MVPA (min/week)	30.0 (225.0)	120.0 (252.5)	30.00 (120.00)	0.38	-108.54 – 288.54
BMI kg/m ²	27.6 \pm 5.6	27.3 \pm 6.5	0.11 (0.54)	0.05	-5.55 – 4.95
SROM (R.) (degree)	152.7 \pm 8.3	152.1 \pm 9.4	-0.45 \pm 4.12	0.07	-8.09 – 6.89
SROM (L.) (degree)	151.2 \pm 7.4	148.9 \pm 6.7	-1.82 \pm 7.17	0.32	-8.32 – 3.72
Steps (reps)	89.0 (23.3)	98.0 (32.0)	9.30 \pm 10.23	0.32	-15.12 – 33.12
Sit to Stand (reps)	17.7 \pm 5.9	18.6 \pm 7.4	0.40 \pm 2.59	0.14	-4.88 – 6.68
Reach R. (cm)	7.0 \pm 12.1	7.9 \pm 8.6	0.50 (7.50)	0.08	-8.15 – 9.95
Reach L. (cm)	6.7 \pm 11.1	7.8 \pm 8.4	1.50 (13.00)	0.11	-7.37 – 9.57
Balance R (sec)	38.9 (38.8)	45.0 (30.6)	0.00 (6.10)	0.17	-23.90 – 36.10
Balance L (sec)	45.0 (24.2)	21.4 (34.8)	0.00 (22.93)	0.79	-49.40 – 2.20

ES=Effect size; Hedge's g of 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; Barrier SE = Barrier Self-Efficacy; OSSS-3 = Oslo Social Support Scale; PSS = Perceived Stress Scale; ULS-6 = UCLA Loneliness Scale; MVPA = Moderate to Vigorous Physical Activity; BMI = Body Mass Index; SROM = Shoulder Range of Motion; Reach = Sit and Reach test

Table 16. Baseline to Post-intervention Differences for the HC Intervention Group in the 8-week Wave

	Baseline: Mean \pm SD Median (IQR)	8WK Mean \pm SD Median (IQR)	Mean \pm SD / Median (IQR) Difference	ES: d	95% CI
FACT-G	79.9 \pm 14.1	84.8 \pm 12.3	4.92 \pm 6.87	0.37	-1.40 – 11.20
FACIT-F	36.9 \pm 9.5	40.9 \pm 8.5	4.00 \pm 6.93	0.44	-0.28 – 8.28
Barrier SE	38.00 (43.00)	61.00 (37.00)	5.50 (42.75)	0.57	3.84 – 42.16
OSSS-3	11.0 \pm 2.3	10.9 \pm 2.1	-0.08 \pm 1.24	0.05	-0.94 – 1.14
PSS	17.0 (12.8)	13.5 (7.8)	-1.33 \pm 4.74	0.33	-2.18 – 9.18
ULS-6	12.6 \pm 4.0	13.3 \pm 3.1	0.75 \pm 1.71	0.20	-1.05 – 2.45
MVPA (min/week)	90.0 (172.5)	257.5 (309.0)	85.00 (221.25)	0.67	28.46- 306.54
BMI kg/m ²	27.4 \pm 5.7	26.8 \pm 5.4	-0.33 (0.89)	0.11	-2.02 – 3.22
SROM (R.) (degree)	157.0 \pm 13.4	157.0 \pm 10.3	0.00 \pm 6.64	0.00	-5.87 – 5.87
SROM (L.) (degree)	158.6 \pm 8.9	158.2 \pm 7.5	-0.42 \pm 6.99	0.05	-3.55 – 4.35
Steps (reps)	83.5 (16.5)	96.5 (18.8)	8.67 \pm 12.24	0.73	4.58 – 21.42
Sit to Stand (reps)	16.8 \pm 3.2	17.3 \pm 4.8	0.42 \pm 5.16	0.12	-1.61 – 2.61
Reach R. (cm)	6.9 \pm 8.7	9.3 \pm 9.1	4.25 (5.38)	0.27	-1.80 – 6.60
Reach L. (cm)	6.8 \pm 7.5	9.7 \pm 7.4	4.00 (6.38)	0.39	-0.61 – 6.41
Balance R (sec)	45.0 (18.8)	45.0 (16.5)	0.00 (5.25)	0.00	-8.42 – 8.42
Balance L (sec)	45.0 (0.0)	45.0 (25.0)	0.00 (3.15)	0.00	-15.88 – 15.88

ES=Effect size; Cohen's d of 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; Barrier SE = Barrier Self-Efficacy; OSSS-3 = Oslo Social Support Scale; PSS = Perceived Stress Scale; ULS-6 = UCLA Loneliness Scale; MVPA = Moderate to Vigorous Physical Activity; BMI = Body Mass Index; SROM = Shoulder Range of Motion; Reach = Sit and Reach test

Table 17. Baseline to Post-intervention Differences for both the 8-Week Wave

Outcome Measures	8-Week Wave			
	Baseline (Mean \pm SD Median (IQR))	8WK (Mean \pm SD Median (IQR))	ES: g	95% CI
FACT-G	79.08 \pm 11.87	82.79 \pm 10.13	0.34	-2.64 – 10.06
FACIT-F	36.84 \pm 7.39	38.25 \pm 10.61	0.15	-3.83 – 6.65
Barrier SE	46.56 \pm 23.06	48.88 \pm 20.58	0.11	-10.26 – 14.90
OSSS-3	11.04 \pm 2.32	10.83 \pm 2.14	0.09	-1.49 – 1.07
PSS	15.44 \pm 6.61	14.00 \pm 6.26	0.22	-5.14 – 2.26
ULS-6	12.88 \pm 3.88	13.63 \pm 2.89	0.22	-1.22 – 2.72
MVPA (min/week)	90.00 (215.00)	185.00 (234.00)	0.42	-34.07 – 224.07
BMI kg/m ²	27.50 \pm 5.54	27.01 \pm 5.76	0.09	-3.81 – 2.83
SROM (R.) (degree)	154.74 \pm 10.99	154.65 \pm 9.97	0.01	-6.21 – 6.03
SROM (L.) (degree)	154.74 \pm 8.80	153.71 \pm 8.41	0.12	-6.04 – 3.98
Steps (reps)	88.46 \pm 16.17	97.39 \pm 19.42	0.50	-1.55 – 19.41
Sit to Stand (reps)	17.25 \pm 4.69	17.87 \pm 6.10	0.11	-2.57 – 3.81
Reach R. (cm)	6.94 \pm 10.38	8.64 \pm 8.67	0.18	-3.88 – 7.28
Reach L. (cm)	6.76 \pm 9.39	8.76 \pm 7.79	0.23	-3.04 – 7.04
Balance R (sec)	45.00 (30.00)	45.00 (22.00)	0.00	-15.40 – 15.40
Balance L (sec)	45.00 (16.00)	45.00 (32.8)	0.00	-15.27 – 15.27

ES=Effect size; Cohen's d / Hedge's g of 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; Barrier SE = Barrier Self-Efficacy; OSSS-3 = Oslo Social Support Scale; PSS = Perceived Stress Scale; ULS-6 = UCLA Loneliness Scale; MVPA = Moderate to Vigorous Physical Activity; BMI = Body Mass Index; SROM = Shoulder Range of Motion; Reach = Sit and Reach test

Table 18. Change Scores of the HC and Non-HC group for both the 8-Week Wave

Outcome Measures	8-Week Wave			
	Non-HC: Mean \pm SD Median (IQR)	HC: Mean \pm SD Median (IQR)	ES: d or (g)	95% CI
FACT-G	1.17 \pm 5.31	4.92 \pm 6.87	0.61	0.74 – 6.76
FACIT-F	-1.08 \pm 9.61	4.00 \pm 6.93	0.61	0.88 – 9.28
Barrier SE	-5.50 (28.0)	5.50 (42.75)	0.30	-7.79 – 29.79
OSSS-3	-0.50 \pm 1.62	-0.08 \pm 1.24	0.29	-0.29 – 1.13
PSS	-1.08 \pm 4.44	-1.33 \pm 4.74	0.05	-1.92 – 2.42
ULS-6	1.08 \pm 2.87	0.75 \pm 1.71	0.14	-0.95 – 1.61
MVPA (min/week)	30.00 (120.00)	85.00 (221.25)	0.31	-45.11 – 155.11
BMI kg/m ²	0.11 (0.54)	-0.33 (0.89)	(0.58)	-1.11 – 0.23
SROM (R.) (degree)	-0.45 \pm 4.12	0.00 \pm 6.64	(0.08)	-4.40 – 5.30
SROM (L.) (degree)	-1.82 \pm 7.17	-0.42 \pm 6.99	(0.20)	-4.74 – 7.54
Steps (reps)	9.30 \pm 10.23	8.67 \pm 12.24	(0.06)	-10.79 – 9.53
Sit to Stand (reps)	0.40 \pm 2.59	0.42 \pm 5.16	(0.00)	-3.73 – 3.77
Reach R. (cm)	0.50 (7.50)	4.25 (5.38)	(0.58)	-1.87 – 9.37
Reach L. (cm)	1.50 (13.00)	4.00 (6.38)	(0.25)	-6.26 – 11.26
Balance R (sec)	0.00 (6.10)	0.00 (5.25)	(0.00)	-4.92 – 4.92
Balance L (sec)	0.00 (22.93)	0.00 (3.15)	(0.00)	-13.90 – 13.90

ES=Effect size; Cohen's d / Hedge's g of 0.2, 0.5, and 0.8 was judged as a small, moderate, and large effect size (Cohen, 1992)

FACT-G = Functional Assessment of Cancer Therapy – General (QoL); FACIT-F = Functional Assessment of Chronic Illness Therapy – Fatigue; Barrier SE = Barrier Self-Efficacy; OSSS-3 = Oslo Social Support Scale; PSS = Perceived Stress Scale; ULS-6 = UCLA Loneliness Scale; MVPA = Moderate to Vigorous Physical Activity; BMI = Body Mass Index; SROM = Shoulder Range of Motion; Reach = Sit and Reach test

Table 19. Percent of Participants Improving, Maintaining, or Worsening by the Minimal Clinically Important Difference for the 8-Week Wave

	Improved		Maintained		Worsen	
	HC n (%)	Non-HC n (%)	HC n (%)	Non-HC n (%)	HC n (%)	Non-HC n (%)
FACT-G	6 (50.0)	6 (50.0)	4 (33.3)	3 (25.0)	2 (16.7)	3 (25.0)
FACIT-F	8 (66.7)	6 (50.0)	3 (25.0)	1 (8.3)	1 (8.3)	5 (41.7)
Balance(R)	1 (8.3)	0 (0.0)	11 (91.7)	11 (100.0)	0 (0.0)	0 (0.0)
Balance(L)	0 (0.0)	0 (0.0)	11 (91.7)	9 (81.8)	1 (8.3)	1 (9.1)
SROM (R)	0 (0.0)	0 (0.0)	12 (100.0)	11 (100.0)	0 (0.0)	0 (0.0)
SROM (L)	0 (0.0)	0 (0.0)	12 (100.0)	11 (100.0)	0 (0.0)	0 (0.0)
MVPA	9 (75.0)	8 (66.7)	2 (16.7)	2 (16.7)	1 (8.3)	2 (16.7)
SittoStand	3 (25.0)	2 (20.0)	7 (58.3)	7 (70.0)	2 (16.7)	1 (10.0)
PSS-10	4 (33.3)	5 (41.7)	6 (50.0)	4 (33.3)	2 (16.7)	3 (25.0)

MCIDs: FACT-G = 3 points; FACIT-F = 3 points (McNeely et al., 2020); Balance = 24 seconds (Goldberg, Casby, & Wasielewski, 2011); SROM = >10°; MVPA = 26min/week (Hur et al., 2019); Sit to Stand = 2.6 repetitions (Wright, Cook, Baxter, Dockerty, & Abbott, 2011); PSS-10 = 2.66 points (Drachev et al., 2020)

*Missing Values: FACT-G = 1 (Non-HC); FACIT-F = 1 (Non-HC); Balance (R) = 2 (Non-HC); Balance (L) = 2 (Non-HC); SROM (R) = 2 (Non-HC); SROM (L) = 2 (Non-HC); MVPA = 1 (Non-HC); Sit to Stand = 3 (Non-HC); PSS-10 = 1 (Non-HC).

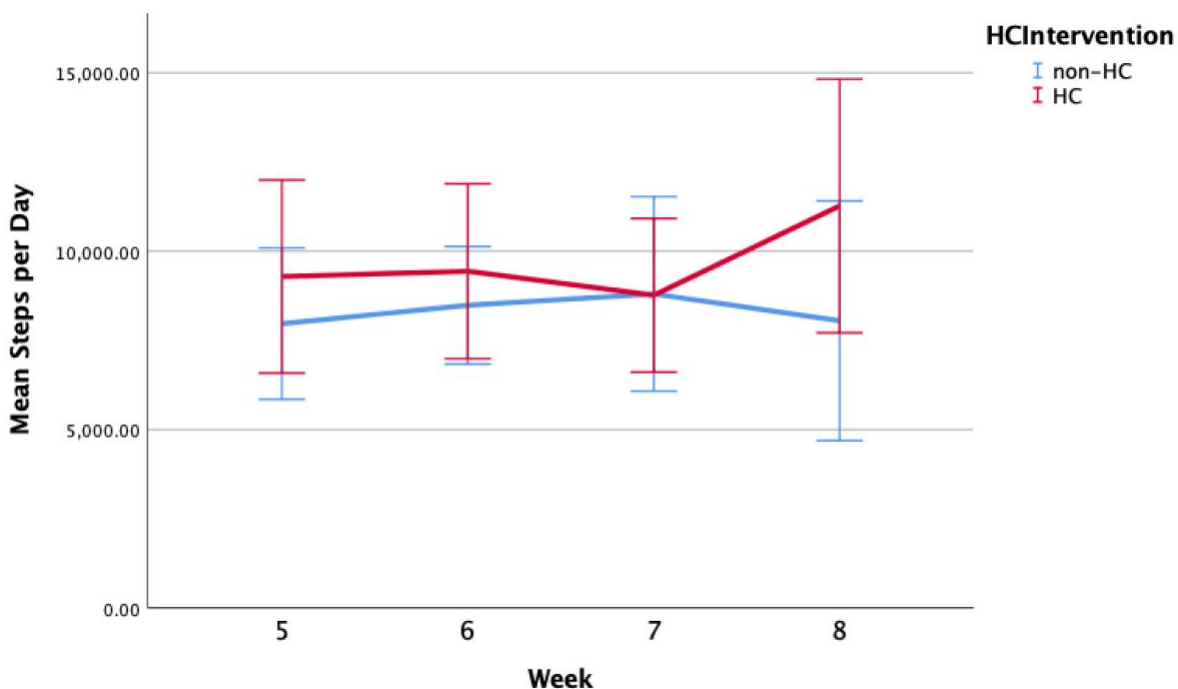


Figure 1. Mean Steps per Day for the Health Coaching (HC) and non-HC Group during the 8-Week Wave

APPENDIX J: EXAMPLE VIDEOS

Set-up video:

An example of a tutorial video that could be send to participants upon receiving of the commercially available activity tracker (Garmin Vivosmart4) can be found [here](#). This tutorial video explains to the participant the exact steps that have to be taken to synchronize the tracker with their unique study account.

Physical Activity Tracking video:

An example of a video explaining how to actively record activities with the Garmin Vivosmart4 can be found [here](#). This video familiarizes the participants with their activity tracker and shows how to record an exercise class with the Garmin Vivosmart4.