Move More for Life: The development and evaluation of a computer tailored-print intervention for promoting physical activity among post-treatment breast cancer survivors

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Statement of Originality

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent for this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright ACT 1968.

Statement of Authorship

I hereby certify that this thesis is in the form of a series of published papers of which I am a joint author. I have included as part of the thesis a written statement from each co-author, endorsed by the Faculty Assistant Dean (Research Training), attesting to my contribution to the joint publications.

5/6/12

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Synopsis

This ‘thesis by publication’ is composed of an introductory chapter, six papers presented as stand-alone manuscripts, and a final chapter providing discussion and conclusions. All papers presented in this thesis relate to the systematic and evidence-based development and evaluation of the Move More for Life intervention, a computer-tailored print intervention designed to promote physical activity in post-treatment breast cancer survivors. At the time of submission, three papers have been accepted for publication in peer reviewed journals; with a further three under review. A synopsis of the thesis is provided below.

The Introduction (Chapter 1) provides a brief overview of the global burden of breast cancer, introduces the role of physical activity-related behaviours (inclusive of aerobic activity, resistance-training and sedentary behaviour) in addressing this burden, and the potential for enhancing both the health and quality of life outcomes of breast cancer survivors. It provides a description of current physical activity-related behaviours among breast cancer survivors and discusses the need to develop services that promote physical activity among this group. Computer-tailored print interventions are highlighted as a promising intervention approach.

Part I: Systematic reviews of the literature examining intervention efficacy

Paper one (Chapter 2), ‘Efficacy of tailored-print interventions to promote physical activity: A systematic review of randomised trials’ [1], presents the results of a systematic review examining the efficacy of computer-tailored print interventions for promoting physical activity among adults. Key factors relating to intervention efficacy
are also explored. The review highlights that tailored-print interventions can be effective in enhancing aerobic physical activity among adults, and that theoretically-based interventions, with multiple intervention contacts seem to be the most effective. No trials evaluating the effects of tailored-print interventions on resistance-training or sedentary behaviours were identified. Recommendations for future research include: a) the need for trials comparing the relative efficacy of tailored-interventions with other promising distance-based approaches (such as targeted-print interventions) rather than comparing to no- or minimal-intervention control groups; and b) focusing on the promotion of other relevant physical activity-related behaviours (such as improving resistance-training and sedentary behaviours) rather than focusing only on aerobic activity.

**Paper two (Chapter 3), ‘A quantitative synthesis of trials promoting physical activity behaviour change among post-treatment breast cancer survivors’ (under review),** presents the results of a systematic review exploring the efficacy of physical activity behaviour change interventions among post-treatment breast cancer survivors. The review shows that while very few trials have been conducted, theory-based behavioural interventions of various intensities and delivery modes do hold promise for effectively changing aerobic physical activity behaviour among breast cancer survivors. No trials examining intervention efficacy for changing resistance-training or sedentary behaviours were identified. Directions for future research are discussed, including the need to address the lack of studies exploring long-term intervention effects, mediators of intervention effects and interventions promoting resistance-training activity, and to address issues impacting on validity such as the limited use of objective physical activity measures and the use of convenience samples.
Part II: Intervention development

**Paper three** *(Chapter 4)*, ‘How Social Cognitive Theory can help oncology-based health professionals promote physical activity among breast cancer survivors’ [2], describes a qualitative study examining the application of Social Cognitive Theory (SCT) to physical activity behaviours among post-treatment breast cancer survivors. The paper highlights that SCT may be a useful theory for guiding physical activity programs among breast cancer survivors. Several intervention implications are discussed, including the need to address skill gaps in relation to resistance-training, misconceptions about the benefits of exercise on cancer outcomes, and the importance of social support for both physical activity adoption and maintenance. It provides suggestions for how SCT constructs could be operationalised in physical activity interventions among breast cancer survivors.

**Paper four** *(Chapter-5)*, ‘The theory-and evidence-based development and evaluation of the Move More for Life program: A tailored-print intervention designed to promote physical activity among post-treatment breast cancer survivors’ *(under review)*, provides a detailed description of the 9-step program-planning process undertaken to develop the *Move More for Life* intervention. The paper highlights the need to provide a detailed description of the intervention development and implementation process in order to allow for critical evaluation of the working mechanisms of the intervention and advance our theoretical understanding of ‘how’ and ‘why’ the intervention works. Development costs in terms of both time and money are also provided.
Part III: Intervention evaluation

Paper five (Chapter 6), ‘Move More for Life: The protocol for a randomised efficacy trial of a tailored-print physical activity intervention for post-treatment breast cancer survivors’ [3], describes the protocol for the 3-arm randomised controlled trial evaluating the efficacy of the Move More for Life intervention. The study design, recruitment strategies, participant selection criteria, randomisation schedule, statistical analyses, outcome measures, and the control (standard recommendation) and intervention (tailored-print and targeted-print) groups are described in detail.

Paper six (Chapter 7), ‘Main outcomes of the Move More for Life Trial: A randomised control trial of the effects of tailored and targeted-print materials on physical activity, sitting-time and quality of life among post-treatment breast cancer survivors (under review)’ is the final paper of the thesis. This paper describes the results of the efficacy trial outlined in the protocol paper. Findings indicated that computer-tailored print materials can be an effective strategy for promoting resistance-based physical activity among breast cancer survivors. The treatment effect of the tailored-print intervention on aerobic activity was more modest, and may be due to ceiling effects. Directions for future research are discussed.

The final chapter (Chapter 8) summarises the main findings of the thesis and discusses potential implications for health promotion practice and policy. The strengths and weaknesses of the thesis are also discussed and suggestions for future research are provided.
List of published papers included in this thesis


List of papers currently under review included in this thesis


Chapter 1

General introduction: Background, rationale, research aims and hypotheses
1.1 The global burden of breast cancer and breast cancer survivorship

Breast cancer is a major public health problem throughout the world. It is the most commonly diagnosed cancer among women worldwide [1] and due to the ageing of the population, the number of women diagnosed with breast cancer each year is expected to increase [2]. In Australia, approximately 12,000 women are diagnosed with breast cancer annually, with current projections estimating a 22% increase in incidence within the next few years [2].

Although breast cancer remains a leading cause of death among women globally, survival rates in developed countries have improved dramatically over the past two decades [1]. In Australia, survival rates are consistently higher than in other countries due to advanced screening and treatment protocols, and outcomes for women diagnosed with breast cancer have improved significantly [3]. The overall 5-year survival rate for breast cancer is currently estimated at 88% [3], which is a 15% increase compared to survival rates for women diagnosed in 1982-1987 [2]. The high incidence rate of breast cancer, paired with the high survival rate has resulted in a growing population of breast cancer survivors. Whilst improved survival is duly welcomed, attention now needs to be focused on how breast cancer survivors cope with the physical and psycho-social consequences of disease and cancer treatment [4].

Modern curative treatments for breast cancer include combinations of surgery (lumpectomy or mastectomy), radiotherapy and chemotherapy [5]. In addition, most breast cancer survivors (80%) are diagnosed with hormone receptive positive tumours and are prescribed five years of hormonal therapy (either tamoxifen or aromatase inhibitors) as a preventive measure to reduce the risk of cancer recurrence [4-6]. All of these treatments are associated with a significant level of burden and disability [4]. Whilst some issues resolve when treatments are completed, several problems persist for
years after the treatment phase (including hormonal therapies) [4]. Some common long-term issues resulting from surgery and radiotherapy include persistent pain in the treated areas (i.e., the breast, arm, and shoulder), lymphedema (localized tissue swelling and fluid retention), and restricted arm and shoulder movement [4, 7, 8]. Persistent effects of chemotherapy include infertility and cognitive problems (e.g., ‘chemo brain’, impairments in verbal and visuospatial ability, processing and memory) [4]. In addition, both chemotherapy and hormone therapy are associated with weight gain and osteoporosis [4, 9, 10]. Persisting psychological issues are also common, and include fear of recurrence, sleep disturbances, cancer-related fatigue and sexual and body image problems [4, 11, 12].

In addition to focusing on rehabilitation and cancer recovery, health promotion focusing on reducing future health risks among survivors is also needed [13]. Compared to the general (non-cancer) population, breast cancer survivors are at an increased risk of developing co-morbid chronic conditions [14-16], developing new primary cancers [15], early mortality from non-cancer causes [14] and are also at a high risk of cancer recurrence [17]. Currently, addressing the rehabilitation and health issues among breast cancer survivors is a largely unmet responsibility of the health care system [18].

1.2 Physical activity as a promising cancer recovery and health promotion approach

There are numerous interventions, programs and support services available to breast cancer survivors to assist in their recovery. For example, within Australia the Cancer Council offers face-to-face support groups and telephone counselling; The Breast Cancer Network provides education and information for women at various cancer stages; and some hospitals and other organisations provide allied health services.
However, the majority of these interventions focus on meeting information and psycho-social needs of breast cancer survivors, and do not address the physical health issues and risks associated with breast cancer survivorship.

One promising strategy associated with both mental and physical recovery as well as risk reduction is the promotion of regular exercise and physical activity. Physical activity (PA) refers to any bodily movement that works skeletal muscles and results in energy expenditure above basal requirements [19]. Exercise is a physical activity that is planned, structured, repetitive and purposeful. The main types of PA and exercise are aerobic and resistance-based activities [19]. *Aerobic activities* use large muscle groups, can be maintained continuously, increase heart rate and are usually rhythmic in nature [19]. Examples include walking, running, dancing, cycling and swimming. *Resistance-based activities* (sometimes called weight or strength-based activities) refer to any activities that use resistance (e.g., weights) to increase one’s muscle strength and/or muscle endurance [19]. These activities involve both concentric (lifting and pushing/pulling) and eccentric (controlled lowering/returning) muscle contractions [20]. Exercising muscle groups using machine weights, free weights (e.g., dumbbells), body weight (e.g., push-ups) and therabands (i.e., long stretchy rubber bands) are examples of resistance-based activities [20].

Findings from rigorously designed health outcome trials provide good evidence that regular physical activity can address both the psychological and physiological burdens that are commonly experienced during and after breast cancer diagnosis and treatment [13, 21-23]. For example, participating in regular aerobic physical activity after breast cancer treatment has been shown to improve aerobic fitness [24, 25], muscular strength [26, 27], physical function [28, 29], body composition [29, 30] and overall quality of life [28]; whilst also reducing pain [31], fatigue [32, 33], bone loss
[10, 34], lymphedema flare-ups [27] and cancer-related chronic-diseases [35]. Participating in regular resistance-based activities after cancer treatment also helps to counteract adverse side effects that impact on quality of life, primarily by improving muscular strength, muscular endurance, body composition and functional ability [26-30].

Importantly, evidence from observational research suggests that regular physical activity may also have an impact on survival, with breast cancer survivors who are active (expending at least 9 metabolic equivalent hours per week) after treatment having a lower risk of cancer recurrence and death from all causes compared to those who are less active (HR = 0.54; 95% CI, 0.38-0.79; P < 0.01), regardless of cancer stage [36-39]. There is also evidence that reductions in physical activity post-diagnosis may be a risk factor for poor cancer outcomes, with women who decreased their physical activity following diagnosis having a four-fold greater risk of death (HR = 3.95; 95% CI, 1.45-10.50), compared to women who increased their physical activity level [39].

In recognition of this evidence, detailed physical activity guidelines designed to maximise quality of life and health outcomes for cancer survivors have been published by professional bodies internationally [20, 40-43]. In brief, these guidelines recommend that all cancer survivors avoid inactivity, and that conditioned cancer survivors engage in moderate intensity aerobic activity for 150 minutes a week spread across the week, and complete at least two sessions of resistance training per week. Additional advice, regarding contraindications due to specific disease and treatment-related side effects (e.g., avoid swimming and the use of public facilities during periods of increased risk of infection), is also provided [20, 40, 41].
1.3 Sedentary behaviour as an important intervention target

There is new evidence that addressing prolonged sedentary behaviour among breast cancer survivors may be beneficial, or even necessary, for improving cancer outcomes [44]. Sedentary behaviour describes activity where there is low energy expenditure and an absence of whole body movement (e.g., watching TV, sitting at a desk typing, driving; [44]). Importantly, sedentary behaviour is distinct from physical inactivity, with evidence that sedentary behaviour is independently associated with metabolic consequences (e.g., increases in adiposity, insulin), regardless of total activity time [44-46]. A number of epidemiological studies have shown that the metabolic consequences of sedentary behaviour are associated with disease risk and all-cause mortality among adults [45-47] and a recent systematic review concluded that sedentary behaviour is associated with increased cancer risk for some cancers (colorectal, endometrial, ovarian, and prostate cancer) and cancer mortality among women (based on a prospective cohort study examining associations between sitting time and mortality resulting from any type of cancer among a large sample of US adults) [47]. Hence, it appears that addressing breast cancer survivor’s pattern of activity is important, requiring both the promotion of aerobic and resistance-based physical activity together with decreased sedentary behaviour to improve health outcomes. Although the science of sedentary behaviour is still relatively new, with much to be done in terms of establishing empirically derived public health messages for reducing sedentary behaviour, key researchers in the field have provided preliminary intervention targets that are both practical and consistent with current epidemiological evidence [45, 48]. Namely, as a starting point Owen et al. [48] suggest that interventions addressing sedentary behaviour should recommend adults limit discretionary sitting time to no more than 2 hours/day, and stand up and move after 30 minutes of uninterrupted sitting.
1.4 The need for low-cost and sustainable services that promote health enhancing patterns of activity among breast cancer survivors

Unfortunately, despite the known benefits of enhancing the pattern of physical activity behaviour, and attempts by health professionals to synthesise this information into public health messages, the majority of breast cancer survivors do not receive any physical activity advice or support from their treatment team [49] and most do not meet physical activity guidelines for aerobic or resistance-training [44, 50-52]. Lynch et al. [44] objectively assessed aerobic physical activity and sedentary behaviour among a representative sample of breast cancer survivors and found that on average, breast cancer survivors spend 66% of their waking hours sitting or lying down, 33% doing light intensity activities such as walking slowly or house work and only 1% of their time doing moderate to vigorous activities that are associated with health benefits. This equates to about 9.3 hours of sitting and only 3.7 (accelerometer-measured) minutes of moderate-vigorous intensity activity per day. This is substantially different to the pattern of activity that is self-reported by Australian breast cancer survivors [50], indicating that some women may be over estimating either the duration or intensity of the activities they engage in.

To facilitate physical activity participation among breast cancer survivors there is a need to develop evidence-based physical activity support services that can be delivered in a cost-effective and sustainable way [53, 54]. To date, the majority of intervention studies have been face-to-face supervised exercise programs focused exclusively on the efficacy of physical activity for enhancing health outcomes [54]. These studies are necessary to establish the benefits and safety of physical activity for breast cancer survivors [55] but are not easily translatable into practice due to the highly controlled delivery settings, costs associated with staff training and employment, and
barriers associated with the significant time and travel commitment for both staff and participants [53, 54]. Furthermore, the majority of these interventions have been atheoretical [56], focused on promoting aerobic activity only [57] and conducted only during the treatment phase [13]. To advance the field, there is a considerable need for the development of low-cost, flexible interventions that promote mixed physical activity types (aerobic and resistance-based) and reduced sedentary behaviour among breast cancer survivors beyond the initial treatment phase [23, 28, 54, 58]. Such programs should allow for sufficient reach, adoption and maintenance to have a substantial public health impact [54] and be based on sound behaviour change theory [59, 60].

Increasing evidence suggests that interventions underpinned by theory are more efficacious than those lacking a theoretical basis [61, 62]. Presumably, this is because theories of behaviour change can help pinpoint what contextual factors need to be considered before developing an intervention and can also provide insight into how to shape program strategies to address these factors [63]. Furthermore, the use of theory-based interventions are necessary so that the mechanisms that mediate behaviour change can be derived, understood and replicated in future interventions [64, 65]. This increases the utility of the research to other intervention developers and boosts the overall public health impact [64].

1.5 Targeted and tailored print interventions

One promising public health approach is the provision of theoretically-based written physical activity resources [54, 66]. In the past, print-based health information has lacked the theoretical and behaviour change focus necessary for intervention effectiveness [67]. Typically, traditional print interventions involved the delivery of generic ‘one-size fits all’ print materials (e.g., brochure on smoking cessation/physical
activity public health brochures). Whilst these interventions were promising from a public health perspective in terms of their low cost and wide reach, they were also relatively ineffective compared to the gold-standard face-to-face interventions [68]. Today, more effective forms of print-interventions known as targeted and computer-tailored print interventions have been developed [68]. Targeted and tailored interventions encompass behaviour change frameworks and employ new communication strategies in an attempt to ‘custom fit’ behaviour change messages to the specific population under study [69]. Ultimately, these interventions attempt to incorporate the types of feedback that would be delivered via face-to-face or telephone interventions by addressing one or more of the unique factors that impact on the health behaviour of each individual [68].

Whilst the terms ‘tailored’ and ‘targeted’ are often used interchangeably in other settings, in this context they refer to two distinct intervention types. Targeted interventions provide information considered relevant to a particular population subgroup, based on a defining characteristic of that group (e.g., gender or cancer type) [68], whereas computer-tailored interventions provide information intended for a specific individual, based on their personal characteristics derived from one or more assessments [68]. In theory, tailored-print interventions should be more effective than targeted print interventions. Theories of information processing, such as the Elaboration Likelihood Model [70], suggest that people are more likely to process information in a way that is conducive to behaviour change if it is personally relevant to them. This explains why both targeted and tailored-print approaches, which both customise messages to some extent, are more effective than generic-print approaches.

Targeted interventions operate under the assumption that the characteristics of the group being targeted are relatively homogenous and can therefore be addressed in a
single message [68]. This is the main limitation of this approach, since the characteristics associated with behaviour change (e.g., social support, confidence, knowledge, geographical location) are often heterogeneous, even among well-defined population sub-groups. In effect, this means that participants in targeted interventions are likely to receive at least some information that is not ‘custom fit’ or directly relevant to them. Computer-tailored approaches on the other hand operate under an assumption of heterogeneity among the target group, and address this heterogeneity by offering multiple message options based on individual characteristics. Hence, the main advantage of computer-tailored approaches is that each participant receives information that is directly relevant to them. The main limitation of the computer-tailored approach is that it markedly more complex and costly to develop. Computer-tailored approaches require hundreds of messages to be written and then matched to participant responses using algorithms and an expert computerised system, which is costly to develop in terms of both time and money [69].

Both targeted and tailored approaches have consistently demonstrated enhanced efficacy compared to generic-print approaches and as such have been put forth as low-cost, evidence-based alternatives to resource intensive face-to-face or telephone counselling programs [68]. Two studies have examined the efficacy of these approaches in the cancer domain. Vallance et al. [71, 72] evaluated the efficacy of a targeted-print approach compared to a generic PA recommendation among breast-cancer survivors and found targeting the intervention led to a mean increase of 39 minutes’ aerobic PA a week at the immediate post intervention follow-up (12 weeks). These effects were largely maintained at the 6 month post intervention follow-up, with a mean difference of 30 minutes of aerobic PA per week. Demark-Wahnfried [73, 74] examined the efficacy of a 10-month tailored-print intervention addressing aerobic PA and diet
behaviours, compared to generic-print information, among newly diagnosed breast and prostate cancer survivors. Participants randomised to the tailored-print intervention experienced greater gains across all health behaviours compared to those in the generic-print group. At 2 months post-intervention, tailoring had a mean increase of 20 minutes of aerobic activity per week, with this effect maintained at the 2 year post intervention follow-up [73, 74]. The relative efficacy of these approaches is hard to evaluate based on these studies, given the difference in study samples, intervention contacts, length, the variety of behaviours targeted and confounders introduced by the different settings (such as the country the research was conducted in). To our knowledge, only one study has evaluated the relative efficacy of targeted and tailored approaches in the physical activity domain. Napolitano et al [75] compared the efficacy of a 6 month tailored-print intervention to a 12-week targeted-print intervention and generic-print intervention among sedentary women. At three months post-baseline, participants in the tailored group reported significantly more minutes of aerobic activity per week than participants in the generic print group (mean difference 49 minutes/week) and targeted group (mean difference 41 minutes/week). The difference between the targeted group and generic group was not statistically significant. Unfortunately, the superior effects of the tailored intervention group were not maintained at the 12 month post-intervention follow-up, with no statistical significant differences between any of the groups. Given the difference in intervention length, this study provides only minimal information regarding the relative efficacy of these two approaches. Further investigation examining the relative efficacy of these two approaches under well controlled conditions is needed. Insight into the effect size obtained by each approach and the cost/benefit associated with each intervention in the physical activity domain will provide important information for future public health interventions in both the primary and tertiary
prevention settings. Furthermore, the development and evaluation of such interventions is necessary to fill the current gap in available physical activity services for breast cancer survivors [20] and has the potential to contribute to a significant improvement of quality of life and health outcomes among breast cancer survivors in Australia and internationally [13, 20].

This thesis provides a detailed synthesis of the evidence relating to computer-tailored print interventions for promoting physical activity, and behaviour change interventions targeting physical activity among breast cancer survivors; and describes the development and evaluation of a computer-tailored print intervention ‘Move More for Life’, designed to enhance physical activity behaviours among post-treatment breast cancer survivors.

1.6 Aims and hypotheses

This thesis has three main aims:

1. To synthesise the existing evidence base on the efficacy of tailored-print interventions for enhancing physical activity behaviour, and behaviour change interventions targeting physical activity among breast cancer survivors (inclusive of aerobic, resistance and sedentary activities).

2. To describe the systematic and evidence-based development of a tailored-print intervention designed to promote health-enhancing physical activity among post-treatment breast cancer survivors.

3. To evaluate the efficacy of the tailored-print intervention, compared to targeted, and generic print interventions for enhancing physical activity behaviours in an adequately powered randomised controlled trial.
We hypothesise that individuals randomised into the tailored-print intervention group will experience significantly greater improvements in all physical activity outcomes (inclusive of aerobic, resistance and sedentary behaviours) at the post-intervention follow-up compared to individuals randomised into the targeted-print and generic-print intervention groups. We expect the greatest difference to be between the tailored-print and generic-print intervention conditions, with participants in the targeted-print intervention group also expected to significantly improve their physical activity behaviour relative to the generic-print group. Overall, we expect the tailored-print intervention to exert a small-medium effect on physical activity behaviour, compared to targeted and generic-print interventions.
References


Part One

Systematic reviews of the literature examining intervention efficacy
Chapter 2

Efficacy of tailored-print interventions to promote physical activity: A systematic review of randomised trials

2.1 Abstract

Objective. Computer-tailored physical activity interventions are becoming increasingly popular. Recent reviews have comprehensively synthesised published research on computer-tailored interventions delivered via interactive technology (e.g. web-based programs) but there is a paucity of synthesis for interventions delivered via traditional print-based media in the physical activity domain (i.e. tailored-print interventions). The current study provides a systematic review of the tailored-print literature, to identify key factors relating to efficacy in tailored-print physical activity interventions. Method. Computer-tailored print intervention studies published up until May 2010 were identified through a search of three databases: Medline, CINAHL, and Psycinfo; and by searching reference lists of relevant publications, hand searching journals and by reviewing publications lists of 11 key authors who have published in this field. Results. The search identified 12 interventions with evaluations reported in 26 publications. Seven out of the 12 identified studies reported positive intervention effects on physical activity behaviour, ranging from one month to 24 months post-baseline and 3 months to 18 months post-intervention. The majority of studies reporting positive intervention effects were theory-based interventions with multiple intervention contacts. Conclusion. There is preliminary evidence that tailored-print interventions are a promising approach to promoting physical activity in adult populations. Future research is needed to further identify key factors relating to efficacy and to determine if this approach is cost-effective and sustainable in the long-term.
2.2 Introduction

Participation in physical activity is well recognised as an important and modifiable determinant of both psychosocial and physiological health. To date, research on physical activity emphasises the health benefits associated with participating in regular moderate-vigorous aerobic activity and strength training over one’s lifetime [1-3]. There is also recent evidence to indicate that prolonged sedentary behaviour, such as sitting, may be an independent determinant of health, with prolonged sitting associated with ill health regardless of total leisure time activity [4-6].

Despite the known benefits of maintaining an active lifestyle, many people living in industrialised societies are considered to be insufficiently active to induce health benefits [7, 8]. In 2000, physical inactivity was estimated to account for 1.9 million deaths world-wide and 19 million disability-adjusted life years [9]. As such, it is not surprising that physical inactivity has been labelled as one of the biggest public health problems in the 21st century [10]. A key challenge is to develop appealing and effective physical activity programs that can be provided in a cost-effective and sustainable manner. Several reviews have suggested that computer-tailored interventions, that utilise technology to provide individuals with customised health behaviour advice and feedback, offer a promising approach to physical activity promotion [11-20]. These interventions are distinct from (yet commonly confused with) generic and targeted interventions because they are aimed at individuals (within a defined population) rather than a population group (generic) or subgroup (targeted) [11]. Since the last decade, the medium for computer-tailored interventions has become
increasingly interactive. Due to advances in technology, there has been a move away from delivering tailored interventions via traditional print media (known as first generation interventions) towards delivering interventions via interactive technology, such as websites or mobile devices (known as second and third generation interventions, respectively [15, 17]).

Second and third generation interventions have been put forth as more promising approaches due to the enhanced potential to provide real-time and interactive feedback to an infinite number of participants [13, 21]. However, whether these benefits translate into enhanced efficacy is unclear. A recent systematic review [15] examining the efficacy of these latter generation interventions reported that 14 out of 17 included interventions were efficacious in changing physical activity behaviour, but only 7 of these were more efficacious than the control condition (all of which were wait-list control or minimal contact interventions). Where interventions were tested against other treatment options (such as non-tailored print materials and non-tailored internet sites), there were no significant between-group differences. There have also been concerns about the external validity of these latter generation interventions, with studies reporting frequent problems recruiting, sustaining engagement and retaining participants [15]. As a result, more intensive web-based interventions have been recommended, such as utilising prompts through other mediums and ensuring websites are continuously updated and contain dynamic and interactive material [15]. Whilst these interventions undoubtedly do hold great public health promise it seems premature to outcast first-generation print-based interventions at this point.
First, there is no evidence that latter generation interventions are more efficacious than traditional print-based approaches. To date, only one study [22] has compared the relative efficacy of a first and second generation intervention in the PA domain and no significant differences in physical activity outcomes were found. Likewise, a recent meta-analysis [19] found no significant differences of the efficacy of computer-tailored interventions based on delivery channel and concluded that both print and web-based channels can be effective means of health communication.

Second, there are benefits and strengths of the tailored-print approach that should be considered: (1) Tailored-print approaches are likely to have a wider reach and acceptability in populations that are known to have low access and use of the internet, such as people living in rural or remote areas, individuals with lower socio-economic status and older adults [23]. Of note, tailored-print strategies may play a special role in secondary/tertiary prevention, where the above characteristics (e.g. older age) exist in a large proportion of the target group (e.g., majority of cancer survivors are over 65 years of age and cite a preference for print-based interventions[24]) and where there are existing support structures in place that can provide the necessary man power to implement interventions (e.g. The Cancer Council);(2) In times where personal letters are scarce and emails are rife, people may perceive the real novelty lies in receiving a tailored letter. According to the Elaboration Likelihood Model [25], which is often given as the rationale for why tailoring works [11], this perception of novelty could lead to more elaborate processing of the tailored material. There is some evidence that this may be the case, with one study reporting participants had a greater recall of mailed print materials compared to
an interactive website [26]. This may also explain why retention for tailored web-based programs is generally poor [15], with the novelty of tailored-websites potentially low compared to other competing sites such as Facebook; (3) If intervention developers are to consider individual preference for delivery mode, there are individuals who report preferring print-based interventions [27, 28]. As there is good evidence that tailoring print materials enhances efficacy [11, 18], it seems justified that intervention developers may provide tailored-print materials to individuals preferring print delivery modes. However, the same is not true for web-based interventions, with minimal evidence that tailoring websites further enhances efficacy in comparison to non-tailored websites [15, 29].

Third, interventions may be more efficacious in changing physical activity behaviour if first and latter generation interventions are combined to form mixed modal interventions. There is evidence that distance-based interventions are more likely to be effective if more than one delivery mode is used [30] and it has already been suggested that including prompts through other mediums may help improve retention rates for tailored-web-based interventions [15].

Hence, the relative ‘promise’ of the different approaches stems beyond the time taken to deliver feedback and is likely to be dependent on a number of factors, including the aim of the intervention and the population targeted. In light of this, intervention developers should base their decision on which delivery method or combination of delivery methods are most appropriate by using an intervention development framework, such as intervention mapping [31].
Whilst the evidence for second and third generation approaches in the physical activity domain has been recently reviewed in a well-conducted systematic review [15], the evidence on tailored-print approaches in the physical activity domain needs updating. The last comprehensive review was conducted a considerable time ago [13] and did not focus on tailored-print physical activity interventions specifically. Likewise, meta-analyses have been conducted but have included other health behaviours [16] and/or other tailoring approaches in the analysis [19]. Reviews that have focused specifically on tailored-print physical activity interventions have been narrative in nature and were conducted over a decade ago [18, 32, 33]. Whilst these reviews provide some insight into how efficacious tailored-print interventions are and some of the key strategies related to efficacy, none provide a comprehensive overview of the state of the evidence in the physical activity domain and none provide sufficient information to serve as a guide to those wishing to develop tailored-print interventions.

The primary purpose of this review is to evaluate the evidence for tailored-print interventions in changing physical activity behaviour, inclusive of aerobic, strength and prolonged sedentary behaviour. Given the known heterogeneity of tailored interventions, this systematic review: a) describes the available evidence; and b) the key factors relating to efficacy. This approach is recommended, rather than a meta-analysis, when there is significant heterogeneity of studies [34]. The secondary purpose of this review is to synthesise the literature in a way that will be valuable to intervention developers.
2.3 Method

Search strategy and data sources

First, studies were identified through a structured electronic database search of all publication years (until May 2010) in Medline, CINAHL, and PsycInfo. The following search strings were used: (physical activity* or exercise or motor activity or leisure activities or incidental activity or physical inactivity or sedentary behaviour*) AND (Tailor* or expert system or print or message) AND (education or behaviour*). These strings were further limited to ‘adults’ (18 years or older) and English language papers. Second, reference lists of relevant publications were scanned for studies not identified in the search process. Third, journals that published a large number of tailored health education articles were identified by sorting via journal name in Endnote. All issues of six selected journals (Preventive Medicine, Annals of Behavioral Medicine, Health Education Research, International Journal of Behavioral Nutrition and Physical Activity, Patient Education and Counselling and Health Psychology) were searched electronically using tailo* and physical activity* as key words. Finally, internet searches were conducted using the names of 11 key authors who have published in this domain.

Study selection criteria

Studies were eligible for inclusion in this review only if they examined at least one computer-tailored print intervention designed to promote physical activity and/or reduce sedentary behaviour in adults. Interventions were considered ‘computer-tailored’ if advice was generated for a specific person based on information derived from individual assessment using a computerised
system [35]. An intervention was considered to be ‘tailored-print’ if it involved the delivery of tailored written materials.

Studies were excluded if they: a) delivered the computer tailored-print intervention in combination with non-print intervention strategies (e.g. tailored-print plus telephone counselling), hence the efficacy of the tailored-print component alone could not be isolated; b) did not include an appropriate comparison condition; or c) did not measure PA behaviour as a study outcome.

Initially, articles were assessed for eligibility by a single reviewer (CS) based on the study title. After this initial cull, study abstracts were assessed independently in an unblinded standardised manner by 2 reviewers. Findings were compared and disagreements between reviewers were resolved by consensus.

Data extraction

Previous published reviews [13, 15, 16, 19] were used as a guide for reviewing selected studies and specific intervention characteristics identified as being associated with behaviour change in computer-tailored interventions were extracted. These characteristics included the a) theory(s) and/or model(s) used to develop the intervention; b) variables used to tailor messages; c) format and content of the print materials; d) frequency and duration of the tailored information being delivered; e) number of behaviours targeted.

Key methodological characteristics of the identified studies were also extracted, including: the country where the study was conducted, size and source of the study population, eligibility criteria, study design, comparison group, the
primary outcome measures and follow-up period. Follow-up periods were divided into three categories: short term (< 3 months), medium term (3-6 months), and long term (> 6 months). The methodological quality of each study was assessed independently by two reviewers using the McMaster quality assessment tool [Appendix 1.2] for quantitative studies developed by the Effective Public Health Practice, Canada [36]. Disagreements were resolved by consensus.

2.4 Results

Study selection

The initial search of the electronic databases yielded 2107 publications, which were reduced to 219 following review of the titles by one reviewer (CS). After removing duplicates and reviewing the abstract (by two independent reviewers), 25 articles met the inclusion criteria for this review and reference checking identified one additional paper. The electronic search of specific journals and search of selected authors did not yield any new papers.

A total of 12 interventions [21, 22, 37-46] were reported in 26 publications [21, 22, 37-62]; with two [59, 62] describing the long-term follow-up of interventions [40, 46]; nine describing sub-analyses, including mediation analyses [50, 51, 54, 58, 61], moderator analyses [57] and cost effectiveness [52, 55]; and three [47-49] describing the study design in additional detail (Figure 2.1).
The studies sourced were categorised by: a) whether the tailored feedback was delivered in a single-contact (referred to as non-iterative) or via multiple contacts (referred to as iterative); and, b) whether the studies focused on a single behaviour (physical activity only) or multiple behaviours (physical activity plus other; Figure 2.2).
Study characteristics

Six of the identified studies tested single contact interventions and six tested multiple contact interventions (Figure 2.2). Of the multiple contact interventions, four [22, 40-42] were related, testing an adapted version of the intervention (developed by Marcus et al 1998 [40]) and/or its trial in different settings. The majority of the multiple-contact interventions focused on the promotion of physical activity alone, whilst most of the single-contact interventions focused on the promotion of multiple health behaviours, including physical activity (Figure 2.2). The type of physical activity targeted ranged from aerobic exercise [39] to activities of daily living, including those performed at a light intensity [22, 37, 38, 40, 41, 43, 44, 46]. The majority of studies focused on
promoting participation in moderate-vigorous physical activity. No studies promoted strength training or reductions in unbroken sedentary behaviour (see Table 2.1, at end of chapter).

The majority of the studies were conducted in North America [21, 22, 37, 39-42] and the Netherlands [38, 43-45] with one study conducted in Belgium [46]. Participants were recruited via advertisements, primary health care and health education organisations. The majority of studies recruited ‘at risk’ individuals, including adults who were sedentary [22, 37, 40-43], overweight [21], patients [39] or older [45], with only three studies recruiting from the general population [38, 44, 46]. Study samples ranged from 194 to 2827 participants with the majority of participants being female, middle-aged and having completed at least a high school education. In studies that reported ethnicity [21, 22, 37, 39-42], the majority of participants were reported as white.

Table 2.1 (at end of chapter) provides a detailed summary of the characteristics of all of the reviewed studies.

**Intervention characteristics**

**Comparison group.** Six studies [21, 37, 38, 40, 42, 44] compared tailored print materials to other non-tailored print materials on the same topic (i.e. generic materials [21, 37, 38, 40, 44] or targeted materials [42]). Five studies [22, 39, 41, 45, 46] tested the relative effectiveness of different tailored interventions against a control group. Of these, three tested variations in tailored print interventions [39, 45, 46] and two compared tailored print interventions to tailored interventions delivered via another method (telephone [41] or internet [22]). Finally, one study [42] compared a single tailored-print group to a control
group. Some studies matched the study conditions to varying degrees by controlling for formatting, theoretical underpinnings and the number of contacts (see Table 2.1).

**Theoretical Models, Tailoring variables and feedback type.** Most of the interventions were informed by The Transtheoretical Model (TTM; [63]) in conjunction with at least one other behaviour change theory (see Table 2.1). In four studies [38, 43-45], an integrated model (I-change model [64]) was used. In other cases, the use (joining) of multiple theories to inform the intervention was based on empirical evidence and expert opinion regarding the determinants of behaviour change. One study [37] relied upon a single theory (TTM) and another [21] made reference to several theory-relevant constructs, without referring to a specific theory.

All studies tailored materials based on psychosocial variables (e.g. perceived barriers), with some also tailoring on behavioural [21, 22, 38-46], demographic [21] and environmental variables [45]. The feedback type differed between single and multiple contact studies, with multiple contact studies able to provide progress feedback on psychosocial and behavioural variables (not possible in single-contact studies) as well as comparative and evaluative feedback (possible in single-contact studies) about how individuals’ health behaviours (e.g. physical activity, nutrition) compare to national recommendations and to the profiles of other successful individuals.

The majority of studies gave some detail about the content of the tailored materials, such as examples of the actual messages [40, 42, 43] or a description of the variables that were used to create each message [21, 37, 38, 43-46].
However, most studies did not adequately describe the operationalisation of the tailoring variables (see Table 2.1). For example, only one study [45], which used an intervention mapping protocol [65], explicitly outlined the theoretical methods and practical strategies that were linked to the tailoring variables used to create each message.

**Delivery and format of print materials.** The majority of tailored print materials were delivered through the mail in either a standard letter or newsletter format [22, 37-45]. Delay in delivery of mailed materials, relative to baseline measurement, ranged from 3 days [37] to 4 weeks [39] in the 8 studies reporting this variable. Two studies [21, 46] delivered print materials onsite. In one of these studies [21], the materials were generated beforehand based on a telephone interview, but the gap between the interview and the onsite visit was not reported. In the second study [46], participants completed the baseline questionnaire on a computer kiosk onsite, and received the tailored feedback instantly on the screen and were given a print out of the information to take home.

**Measurement of tailoring variables**

The majority of studies reported some information regarding how many items were used to assess the tailoring variables and the number of response options per item (Table 2.1). Only three studies [22, 40, 41] provided psychometrics (i.e. reliability/validity information) for each item or set of items associated with the tailoring variables; and four [37, 38, 42, 43] provided some psychometric information about their measures for at least one but not all of the
variables. Variables relating to the TTM were well-described across studies; those relating to other theoretical frameworks were inconsistently reported.

**Measurement and primary outcome variables**

*Physical Activity.* All studies assessed physical activity behaviour using subjective self-report measures. One study [41] used an objective measure to confirm the validity of the questionnaire (weak correlation) and two [22, 41] used an objective measure as a secondary outcome (fitness measured by a graded submaximal exercise treadmill test). Of the self-report measures that were used, nine studies [22, 38, 40-46] reported that the measure was valid and reliable and three studies [21, 37, 39] used single-item questions with unknown reliability and validity.

Nine studies [21, 22, 37, 38, 40-42, 45, 46] used continuous primary outcome variables (i.e. minutes/week [22, 38, 40-42, 46]; number of sessions per week/month [21, 37, 45]). Four of these studies [38, 40, 41, 45] also calculated a dichotomous categorical primary outcome variable of whether or not participants were meeting a national health recommendation for physical activity. Three studies [39, 43, 44] used a categorical primary outcome variable only (yes/no meeting PA guidelines [43, 44]; yes/no exercising > three times a week [39]).

Most studies based outcome assessment on multiple domains of physical activity (e.g. leisure, transport, occupation) performed at a moderate intensity or higher, except for one study [39] that only measured aerobic activity and one [46] that included light physical activities as a part of a total physical activity score (Table 2.1). Two studies did not specify the intensity of the PA measured [37, 39] but specific categories of PA were provided.
Follow-up periods. Post-baseline and post-intervention follow-up measures are described in Table 2.1. Follow-up periods for single-contact interventions ranged from short-term (1 month) to mid-term (6 months). Multiple contact studies had longer post-baseline follow-up periods ranging from mid-term (3 months) to long-term (12 months) but some of these studies did not include post-intervention measures [22, 41]. Post-intervention measures in the multiple contact studies ranged from 3 months [38] to 6 months [59].

Review of methodological quality

Based on assessments by two reviewers using a standardised tool [36], only one [44] of the studies was rated as ‘strong’, eight [22, 37, 39-42, 45, 46] received a global rating of ‘moderate’ and three [21, 38, 43] received a global rating of ‘weak’. Inter-rater-reliability between the two reviewers was high and all discrepancies were resolved via consensus. Inadequate reporting of randomisation method, consent rates, assessor and participant blinding to study outcomes, and withdrawal differences between study groups were common methodological limitations across studies. All studies relied solely on subjective self-report measures of physical activity behaviour for the primary outcome. Marcus et al. (2007a; [41]) used an objective measure (accelerometer) to confirm the validity of the self-report measure but the correlation coefficient was weak (.32). Marcus et al. [48] also reported using an accelerometer to verify responses, but these data were not reported [22]. In three studies [21, 37, 39] the measures had not been validated and were not as comprehensive (single-item) as the measures used in the other studies (multiple items). Selection bias was a potential issue in nine studies [21, 22, 38, 40-43, 45, 46] due to a low consent
rate and/or the recruitment method (self-referral). Intervention integrity was compromised in the majority of studies [21, 37, 39, 40, 44-46, 59] by failure to undertake (or report undertaking) intention to treat analyses. Of these studies, dropout rates ranged from 14% [39] to 39% [59] and one study did not report on participant withdrawal [21]. Only five studies [38, 39, 43-45] reported the magnitude of intervention effects (i.e. effect sizes). Table 2.1 describes the methodological subcomponents that obtained a weak rating for each of the included studies.

**Intervention effects on physical activity**

As no studies targeted reductions in unbroken sedentary time or participation in strength training, the following results relate to aerobic physical activity performed at a light-to-vigorous intensity.

Seven [38, 40-42, 44-46] studies reported significant short- to long-term positive intervention effects on PA, ranging from 1-24 months post-baseline and 3-18 months post-intervention. In one study [44], the positive effect was defined as a reduction in the decline of physical activity over the study period (3 months) compared to the control. Where calculated, intervention effect sizes were reported as small (Cohen’s $d$ ranging from 0.12-0.35; Odds ratio’s ranging from 0.82-1.34; [38, 39, 43-45]) but fewer than half of the studies made this calculation. Five of the studies (out of the seven with positive results) included multiple post-baseline follow-ups [38, 40-42, 46]. Sustained intervention effects were found in all but one study [42]. In another study [40], sustained effects (at 12 months) were found for meeting physical activity guidelines but not for minutes/week of physical activity.
Of the five studies [21, 22, 37, 39, 43] that did not find significant positive intervention effects on physical activity: two [22, 37] reported significant increases in physical activity in all study groups but no significant differences between groups at mid- and long-term; one study [38] found a positive intervention trend that was not significant at mid-term; one study [43] reported significant positive intervention effects at mid-term for motivated participants only; and one study [37] revealed significant increases in participants’ preferred type of physical activity at mid-term but no overall intervention effect on total physical activity. Only one study [21] reported a negative intervention effect (in a sub-analysis), where participants receiving generic materials that matched their individual characteristics (by chance) increased their physical activity more than participants receiving (deliberately) tailored print materials at short-term.

**Evaluation of key intervention factors impacting on effectiveness**

*Number of contacts.* Multiple-contact studies appeared to be more effective in changing physical activity behaviour than single-contact studies. Only two [43, 46] of the six single-contact studies reported the tailored-print interventions as superior to the control group. In contrast, five [38, 40-42, 45] out of the six multiple-contact studies reported superior intervention effects for the tailored-print condition. The remaining study [22] reported significant intervention effects, but did not find between-group differences between the tailored-print arm and two theory-based internet arms (one tailored and one non-tailored).
**Number of behaviours targeted.** Out of seven studies reporting positive intervention effects, four focused on physical activity behaviour only [40-42, 45] and three targeted multiple health behaviours. This is potentially confounded by the greater number of multiple-contact studies focusing specifically on physical activity behaviour and the greater number of single-contact studies targeting multiple behaviours (Table 2.1).

**Comparison groups.** Comparison groups may have partially explained intervention effects. While there were no clear differences between minimal (e.g. generic materials) or no intervention control groups, of exception were the studies testing tailored-print materials against more rigorous interventions (targeted-print materials [42], tailored-telephone calls [41] or a tailored website [22]). Only one of these studies found a significant intervention effect in favour of the tailored-print materials [41]. It is worth noting that in this study, both interventions (tailored print and tailored-telephone calls) produced positive effects at mid-term but only the tailored-print condition produced sustainable effects at long-term. In the other studies comparing tailored print to more rigorous interventions, a marginally significant positive effect was found (compared to the targeted materials) at mid-term but not at long-term [42] and significant increases in PA were found across conditions (tailored-print and tailored-internet and standard internet) but no significant between group difference at mid or long-term were reported [22].

Of the three studies comparing the relative effectiveness of variations in tailored print interventions (varying on one factor) to a control group, significant intervention effects were attributed to differences between the intervention arms
and the control group only. That is, intervention effectiveness was not enhanced nor reduced by the inclusion of environmental information [45], action plans [38] or by whether or not information on different behaviours was delivered simultaneously or sequentially [46]. Of note, a significant positive effect of including environmental information in the tailored-print materials [45] was reported in a subsequent paper due to differences in primary outcome variables (i.e. total weekly days of physical activity verses total weekly minutes of physical activity; [57]).

**Theoretical underpinning.** Interventions seemed to be most effective when underpinned at least in part, by either: Social Cognitive Theory, The Theory of Planned Behaviour or the I-Change Model. The use of the TTM alone [37] or the use of no theory [21] may be related to lower efficacy.

**Delivery delay of print materials.** Delivery time may have had an effect on intervention efficacy but it is difficult to draw a clear conclusion due to the lack of available information. Of the seven studies that reported positive intervention effects on primary outcomes, four did not report delivery timeframes of print materials (see Table 2.1). Where delivery time-frames were reported, positive intervention effects were found for studies delivering feedback ranging from immediately up until 2 weeks post baseline.

**Primary Outcome Variables.** There were no clear differences in overall efficacy based on the use of continuous verses categorical dichotomous primary outcome variables. There was some indication that both types of outcome variables may be sensitive to detecting behaviour change at different time-points
but this was not the case in the majority of studies that included both types of outcomes [38, 41, 45].

Methodological quality. There were no marked differences in the overall methodological quality between studies reporting significant versus non-significant results. However, studies reporting a positive result were more likely to have used a valid and reliable physical activity performance measure (Table 2.1). Overall, the majority of studies reporting positive intervention effects were rated as ‘moderate’ in methodological quality [40, 41, 45, 46], with one rated as ‘strong’ [44] and only one rated as ‘weak’ [38].

Mediators and moderators of intervention effects

Six studies [21, 41, 43-46] tested for interaction effects in order to identify possible modifiers. Whilst several modifiers were identified, the direction of modification was inconsistent across studies. For example, where BMI was assessed, one study [46] reported an association between higher BMI and increased PA, two studies [21, 45] reported an association between lower BMI and increased PA and one study [44] reported no association. Of importance, there was some indication that intervention effects were not moderated by physical activity levels at baseline.

Only four studies [21, 40, 41, 45] conducted mediation analyses. Analyses were restricted to variables relating to the TTM and perceptions about the tailored materials. The results of these analyses were inconclusive and provide only minimal evidence that physical activity increases are mediated by changes in constructs from the TTM (i.e. self-efficacy, cognitive and behavioural processes, decisional balance).
Cost-effectiveness

Only two studies [52, 55] reported cost-effectiveness data. These studies were related, testing the same 12 month tailored-print intervention against different conditions (tailored-telephone [55]; tailored-internet [52]). The cost of delivering the tailored-print intervention ($35.81 per month per participant [52]) was consistent between studies. In the study comparing tailored print to tailored telephone calls [55], print was found to be more cost-effective at 12 months in terms of the cost of moving one person out of sedentary behaviour ($955 for the print group and $3,967 for the telephone group)[55]. Likewise, in the tailored-print versus tailored internet study [52], print was reported as more cost-efficient at 12 months in terms of intervention delivery costs ($439 per participants per year compared to $1,470.29). However, it was noted that the internet intervention may be less costly per participant if the number of participants was increased (i.e. assuming the same additional costs for each added participant the internet intervention would be less costly than the print condition when N >352). Of note for intervention developers, the tailored print and tailored-internet interventions cost $10,742 and $109,564 (USD) respectively, to develop.

2.5 Discussion

This systematic review advances the field of knowledge on the efficacy of first generation tailored-print interventions in promoting physical activity behaviour in adults. Whilst the small number of relevant published studies needs to be considered when drawing conclusions from the review, it provides evidence for the efficacy of tailored-print interventions for enhancing aerobic physical activity participation in adults. Both single-contact and multiple-contact
studies of reasonable methodological quality have demonstrated they can be efficacious in promoting physical activity behaviour in the mid and long-term. Nevertheless, the magnitude of the effect is unclear and evidence is restricted only to aerobic physical activity and assessed mostly in the mid-term.

**What do these studies tell us about optimum intervention intensity?**

The delivery of more than one tailored-print material seems to be a key determinant of intervention efficacy, with multiple-contact studies showing superior effects compared to single-contact studies. This indicates that more intensive interventions, in terms of both contact and ability to provide relevant feedback, may be more efficacious. Exactly how many tailored-print materials should be delivered and in what timeframe, is difficult to determine due to the heterogeneity of studies, the limited number of effect-size calculations and the lack of post-intervention follow-ups in multiple-contact studies. This finding is consistent with previous research [16, 19].

One important consideration, from a public health perspective, is that optimal intervention intensity may be dependent on participant characteristics, with single-contact interventions sufficient for individuals ready or able to make behaviour changes but not for individuals with higher needs. This would explain why positive intervention effects in single-contact studies were limited to those conducted with self-referred healthy adults and not those conducted with sedentary and ‘at risk’ individuals. Furthermore, this would explain why motivated ‘at risk’ participants responded more positively to the intervention [43] and why they were more likely to increase PA that they enjoyed [37].
Hence, the search for an ‘optimal intensity’ may be population and behaviour specific.

**What do these studies tell us about the constructs used to tailor messages?**

To date, much remains unknown about what specific aspects of tailoring contribute to the effectiveness of tailored messages. This is known as the ‘black box of tailoring’. In the reviewed studies, tailored messages were primarily composed of messages pertaining to physical activity behaviour and psychosocial constructs, drawn from a handful of behaviour change theories. Overall, the constructs used to tailor messages between studies were similar but there was some variability in how the constructs were used that may explain the differential intervention effects. For example, the theoretical construct ‘stage of change’ was used to decide: who would receive information about physical activity at all [37, 39]; which information was emphasised [43]; and how feedback on other constructs, such as self-efficacy, would be delivered [44, 46]. The relative effectiveness of these approaches is unclear, although it seems that using the stage of change construct to determine what to emphasise or how to present information is more effective than using it to screen participants. There was also variability in the type of feedback or information given for each construct. For example, behavioural feedback seemed to be more effective when it was based on individual progress rather than when it was based on comparisons with perceived level of activity or current guidelines.

Given that the majority of studies were ‘theory-based’, they should provide some insight into how tailoring ‘works’, that is, theory should provide a common description of what is known within an organising system [66].
Unfortunately, in many studies, theory was used as a ‘loose framework’, with theoretical constructs rather than theory used to guide the development and delivery of the intervention and such constructs not always considered in the analysis and interpretation of study outcomes.

Another factor contributing to the ‘black box of tailoring’ is the lack of analysis regarding the mediators and moderators of intervention effects. Whilst some studies reported these analyses, there were too few to draw specific conclusions about why tailoring ‘worked’. Self-efficacy appears to be an important construct, but the evidence is inconclusive. There was also evidence that tailored-print interventions based on these constructs work equivalently for people with different levels of physical activity at baseline. This highlights the potential for tailored-print interventions to play a significant role in physical activity maintenance as well as initiation.

**Generalisability of the findings**

Although this is the most comprehensive review of the efficacy of tailored-print interventions to promote physical activity behaviour change in adults, several factors may impact on the generalisability of its findings. First, the findings are based on a small number of studies (12) of predominantly middle-aged, inactive females. Second, the review did not include grey literature (i.e., unpublished studies), hence publication bias may be an issue. However, given the number of published studies with null findings or small effect sizes, we believe publication bias is unlikely. Third, the included studies were limited to those focused on primary prevention. Several tertiary interventions were identified, but these were excluded because they included additional intervention
components that made it impossible to isolate the effects of the tailored-print components. Fourth, it was beyond the resources of this project to include papers published in languages other than English. Finally, the methodological review conducted as a part of this study revealed several methodological weaknesses that should be considered when interpreting the generalisability of our findings. Despite these factors, this review provides significant insight into the state of the evidence and highlights key directions for future research.

**Future directions**

Future consideration should be given to (1) the theoretical underpinnings of tailored-interventions; (2) how we can determine which components of tailored interventions are important; (3) the impact of different intervention intensities; (4) the most appropriate comparison groups in tests of intervention efficacy in terms of both PA outcomes and cost; (5) what population parameters, if any, are predictive of success in tailored-print interventions; and finally (6) the type of physical activity that should be promoted and how it should be measured.

_A move towards Social Cognitive Theories._ All but one of the interventions in this review explicitly referred to the TTM as forming a part of the theory-base for the intervention. This is not surprising, in that the TTM offers an intuitive way to tailor information. However, since many of these studies were conducted, the use of the TTM in the physical activity domain has become controversial, with suggestions that there is little evidence that stage-based interventions are effective in the long-term [67]. Furthermore, reviews of tailoring research have shown that interventions that are developed based on
social cognitive theories are most effective [16, 19]. This was supported in this review with studies underpinned by Social Cognitive Theory or The Theory of Planned Behaviour demonstrating more positive effects. Future research should focus on operationalising these social cognitive theories by mapping the theoretically derived determinants (psycho-social constructs) to behaviour change techniques that can be used in a distance-based and tailored setting (see Michie et al. [68, 69]). Intervention developers should also consider selecting behaviour change techniques that have known efficacy in terms of positive increases in physical activity and associated determinants [70-73]. For example, there is increasing evidence that targeting self-regulation constructs is a promising approach [72, 74]. Finally, researchers should detail this process so that there is transparency about how the theoretical underpinnings guided the development of the intervention and to determine the extent to which the interventions were tailored.

Mediator analyses. Future studies should seek to identify what tailoring components lead to successful outcomes by conducting appropriate mediation analyses and interpreting results (in light of these analyses) and the theory used to guide the development of the intervention.

Optimum intervention intensity. Whilst there is growing evidence that multiple contact studies are more efficacious than single contact studies, there is still only limited information about the optimal number of intervention contacts and the optimum delivery schedule in multiple contact studies. Intervention developers should base intervention intensity decisions on what is known about
the population and report effect sizes for both immediate and long-term follow-ups.

Distance-based intervention alternatives. Due to the predominant use of no-information or generic information control groups and the limited reporting of effect-sizes, the reviewed studies provide only limited information as to whether tailored-print interventions are comparative in efficacy to other promising interventions, such as targeted-print interventions or second and third generation tailored interventions (e.g. tailored websites, emails, text messages). The comparison between targeted-print materials and tailored-print materials is particularly important. Targeted materials (those aimed at specific subgroups) are less resource intensive (in terms of both time and cost) and may be equally efficacious in promoting health behaviour change, especially when the target group is somewhat homogenous in terms of demographics, psychosocial characteristics and behavioural patterns. As effective print-based interventions are needed, future research should focus on determining the relative effectiveness and cost-benefit of these two approaches. More research is also needed comparing tailored interventions delivered via different channels or mixed model methods (e.g. complete an online survey and receive a tailored letter via the mail). In all cases, comparison interventions should be rigorously developed and theory-based and the costs associated with development and delivery should be reported where possible.

Diverse target populations and moderator analyses. The majority of participants included in the trials summarised in this review were white middle-aged sedentary women. Future research should focus on whether or not tailored-
print approaches are effective in other target populations, such as in tertiary prevention, with younger populations or with already active individuals (to facilitate maintenance). Future research should aim to test the generalisability of our results by testing the efficacy of tailored-print interventions in understudied and diverse populations and by conducting moderator analyses that highlight which specific sub-groups interventions were most efficacious in. These analyses could then inform the development of both tailored and targeted intervention materials.

*Addressing common problems in PA research.* Future studies aiming to promote PA participation should consider targeting both aerobic and strength based physical activities. Furthermore, in light of the new evidence surrounding sedentary behaviour [4-6], physical activity could be promoted in a way that breaks up time spent sitting or laying down during waking hours. This requires a shift in focus from looking at the total amount of physical activity to the pattern of activity each day and a subsequent change in measurement tools.

All of the studies included in this review relied upon subjective measures of physical activity. Future studies should include objective and sensitive physical activity measures; for example accelerometers and pedometers (with a diary) may be particularly useful, especially for determining the pattern of physical activity behaviour. Future studies should also consider the length of follow-up necessary to inform policy makers and health practitioners on the sustainability of the effects. Several of the reported multiple-contact studies did not include post-intervention follow-ups; and where they were included, they were of no longer than 6 months post-intervention. Given the tendency for
relapse once intervention support is withdrawn, the follow-up periods in these studies are inadequate for assessing the long-term efficacy of the intervention. Furthermore, given that physical activity benefits are obtained from sustained and regular participation, future studies should be powered to assess multiple follow-up periods over an extended period of time, inclusive of short, medium and long-term follow-up periods.

2.6 Conclusion

There is preliminary evidence that tailored-print interventions are a promising approach to promoting physical activity in adult populations. Future research is needed to determine if this approach is cost-effective and sustainable in the long-term, especially in comparison to other distance-based interventions showing potential, such as targeted-print interventions or other tailored interventions. This systematic review can serve as a guide to researchers and practitioners interested in understanding and/or developing tailored interventions in the PA domain.
Table 2.1: Summary of the design and intervention characteristics of the reviewed studies

<table>
<thead>
<tr>
<th>Study and sub-study references</th>
<th>Study</th>
<th>Change of Heart Study</th>
<th>FAITH Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Smeets et al 2007 [44]</td>
<td>Netherlands</td>
<td>Belgium</td>
</tr>
<tr>
<td>Sample</td>
<td>Patients from family medical clinics in contemplation or preparation stage of change (N = 272)</td>
<td>Sedentary adults (not meeting PA guidelines) recruited via mass mail out with addresses obtained from telephone company (N = 487).</td>
<td>Patients from family medical clinics (N = 1317)</td>
</tr>
<tr>
<td>Behaviour</td>
<td>PA (leisure &amp; PADL)</td>
<td>PA (leisure &amp; PADL)</td>
<td>PA (leisure &amp; PADL)</td>
</tr>
<tr>
<td>Targeted</td>
<td>PA (transport, sport, leisure)</td>
<td>PA (aerobic, transport, sport, leisure)</td>
<td>PA (transport, sport, leisure)</td>
</tr>
<tr>
<td>Comparison group(s)</td>
<td>Personalised print (PA);</td>
<td>No Info</td>
<td>Risk feedback;</td>
</tr>
<tr>
<td></td>
<td>General print (PA);</td>
<td></td>
<td>No Info</td>
</tr>
<tr>
<td></td>
<td>Usual care;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Controlled for formatting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA primary outcome measures</td>
<td>Frequency of PA for 30+ min a day in the past week for 8 different categories of PA.</td>
<td>Self-report SQUASH questionnaire.</td>
<td>Single item</td>
</tr>
<tr>
<td>PA primary outcome variables</td>
<td>Total number of Sessions</td>
<td>Meeting recommendation</td>
<td>Engaging in aerobic exercise 3 times a week (yes/no)</td>
</tr>
<tr>
<td>-----------------------------</td>
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<tr>
<td>Follow-up (post-baseline)</td>
<td>3 months</td>
<td>3 months</td>
<td>6 months</td>
</tr>
<tr>
<td>Results</td>
<td>Increases in PA sessions across all groups but no differences between study groups on total number of PA sessions at mid-term. Significant intervention effect at mid-term for preferred PA type. Marginally significant effects for PADL.</td>
<td>No post-test group differences for meeting the recommendation at mid-term</td>
<td>Marginaly significant intervention effect at mid term for change in at least one behaviour (OR =1.18, p &lt; 0.06).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Methodological Quality</th>
<th>Moderate</th>
<th>Weak</th>
<th>Moderate</th>
<th>Weak</th>
<th>Strong</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline PA not reported.</td>
<td>Low consent rate (30%) Withdrawals reported but high drop out.</td>
<td>Validity of measure not established No intention to treat analysis.</td>
<td>Recruited via self referral. Baseline PA not reported. Validity of measures not established. Withdrawal not reported.</td>
<td>Intention to treat analysis not reported.</td>
<td>No intention to treat analysis. Participants recruited via self referral</td>
<td>No intention to treat analysis and drop out per intervention group not described.</td>
</tr>
<tr>
<td>Theory</td>
<td>Stages of Change</td>
<td>I-Change Model</td>
<td>Stage of Change</td>
<td>Theory not explicitly stated by the author.</td>
<td>I Change</td>
<td>Theory of planned behaviour</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables used for tailoring</th>
<th>Stage of change **</th>
<th>Stage of change (calculated) *</th>
<th>Stage of change -</th>
<th>Beliefs – Motives – Barriers – Triggers –</th>
<th>Awareness -</th>
<th>Stage of change -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>Exercise goal*</td>
<td>Awareness of PA *</td>
<td>Perceived barriers -</td>
<td>Self-efficacy - Goal-setting - Preferred media and learning style-</td>
<td>Attitudes *</td>
<td>Intentions – attitudes-</td>
</tr>
<tr>
<td></td>
<td>Motives for exercise *</td>
<td>Reasons for wanting change -</td>
<td></td>
<td></td>
<td>Self-efficacy*</td>
<td>self-efficacy- social support- knowledge- benefits/barriers of behaviour change-</td>
</tr>
<tr>
<td></td>
<td>Perceived barriers *</td>
<td>Perceived health risks -</td>
<td></td>
<td>BMI –</td>
<td>Social influence of partner *</td>
<td>PA score**</td>
</tr>
<tr>
<td></td>
<td>Social influence *</td>
<td>Perceived health benefits -</td>
<td></td>
<td>Gender –</td>
<td>Barriers –</td>
<td>PA score**</td>
</tr>
<tr>
<td></td>
<td>Preferences for PA *</td>
<td>Self-efficacy -</td>
<td></td>
<td></td>
<td></td>
<td>*Feasibility trial describes assessments as “based on previous research” but details not given.</td>
</tr>
<tr>
<td>No description -</td>
<td>Suggestions to cope with barriers (self-efficacy enhancing info)*</td>
<td>Past attempts and failures to change behaviour –</td>
<td></td>
<td></td>
<td>*Measures described as: close-ended questions with 2-8 response options.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preferred activity –</td>
<td>PA score **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PA score **</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operationalised?</th>
<th>Stage of change: Only individuals at contemplation and preparation given advice about PA. Examples given of how tailoring variables used.</th>
<th>Stage of change score determined which parts of feedback received the most attention. Examples given</th>
<th>Received tailored information when a behaviour was a problem and they were interested in changing it. Citation given for types of message example but none relate to PA</th>
<th>lists broad content area of weight loss materials</th>
<th>SOC message differed according to attitude and self-efficacy</th>
<th>How each theory was used described. Constructs in TPB not described.</th>
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</thead>
<tbody>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Delivery method &amp; delay</th>
<th>Mailed within 3 days</th>
<th>Mailed within a few days to 2 weeks following baseline</th>
<th>Mailed within 2-4 weeks of baseline</th>
<th>Onsite</th>
<th>Mail - time not described</th>
<th>Print out onsite</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Immediate feedback</td>
</tr>
<tr>
<td>Format of materials</td>
<td>2 page letter</td>
<td>3-5 page Letter</td>
<td>Health Risk Assessment + Single page for every problem behaviour they were interested in changing. Text and graphs</td>
<td>4 pages of text Multi-colour printing</td>
<td>5-11 pages letter Cartoons, text and graphs.</td>
<td>Displayed on computer screen, read, printed and taken home (5-6 pages)</td>
</tr>
<tr>
<td>---------------------</td>
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<td>--------------------------------------------------------------------</td>
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<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Content of Print Materials</td>
<td>Feedback based on psycho-social constructs Feedback type not specified</td>
<td>Tailored feedback based on Psycho-social constructs and behaviour scores</td>
<td>Contents consist of health risk appraisal and tailored information Feedback based on psychosocial and behavioural variables Descriptive feedback: List risk behaviours. Evaluative feedback: List which behaviours need to be changed and suggest change strategy based on psycho-social construct.</td>
<td>Tailored Feedback based on psychosocial, behavioural and Demographic variables</td>
<td>Tailored feedback based on psychosocial and behavioural variables Evaluative: PA score compared to self-assessed PA level and recommended minimum level. Misconceptions addressed. Behaviour change strategies based on psycho-social variables.</td>
<td>Tailored feedback based on psychosocial and behavioural variables. Evaluative: PA level compared to recommendation. Tips given to increase PA in different settings based on psycho-social variables.</td>
</tr>
<tr>
<td>Delivery Schedule</td>
<td>Baseline</td>
<td>Baseline</td>
<td>Baseline</td>
<td>Baseline</td>
<td>Baseline</td>
<td>Baseline</td>
</tr>
<tr>
<td>Interpretation of results based on theory?</td>
<td>Focus in on variability rather than theory.</td>
<td>ELM</td>
<td>Motivation</td>
<td>HBM provided a useful framework for identifying important intervention components to include in tailored materials. But no analysis into how they mediated intervention effects</td>
<td>Cognitive responses to intervention material coded based on ELM and past research.</td>
<td>Tested moderators of effectiveness</td>
</tr>
</tbody>
</table>
## Multiple-contact studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Jump Start</th>
<th>Women's wellness project</th>
<th>Project STRIDE</th>
<th>STEP into Motion</th>
<th>Active Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adapted from jumpstart</td>
<td>Adapted from Jump Start</td>
<td>Adapted from jump start</td>
<td></td>
<td></td>
</tr>
<tr>
<td>references</td>
<td>Follow-up [59]</td>
<td>Sub-analysis [55] [54] [51]</td>
<td>Sub-analysis [52]</td>
<td>Sub-analysis [57-58]</td>
<td></td>
</tr>
<tr>
<td><strong>Country</strong></td>
<td>North America</td>
<td>North America</td>
<td>North America</td>
<td>North America</td>
<td>The Netherlands</td>
</tr>
<tr>
<td></td>
<td>North America</td>
<td></td>
<td></td>
<td>The Netherlands</td>
<td></td>
</tr>
</tbody>
</table>

**Sample**

- Sedentary adults recruited through newspaper advertisements (N = 194)
- Sedentary women recruited via info booths in supermarkets and health fairs and advertisements using local media (N= 280)
- Sedentary adults recruited via self-referral (N = 239)
- Sedentary adults recruited through newspaper advertisements (N=249).
- Older adults recruited from health organisations (N = 1971).
- Adults recruited from telephone company (N = 2827)

**Behaviour**

- PA (light-vigorous)
- PA (moderate – hard activity)
- PA (moderate intensity to a level that met or exceeded ACSM recommendation)
- PA (light-vigorous)
- PA (Moderate)
- PA (Inferred -light-vigorous)Nutrition, Non Smoking

**Targeted**

- Generic print (PA) controlled for contact time and number of materials.
- Targeted info (PA: choose to move);
  General info (sleep, cancer prevention, nutrition). *One mailing
- Tailored telephone;
  Generic print (attention control).
- Tailored internet;
  Standard internet
- No info control
  Environmentally tailored print

**Comparison group(s)**

- Generic print controlled for formatting and theoretical constructs

**PA primary outcome measures**

- Self-report - adapted from seven-day PA recall questionnaire.
- Seven-day PA recall questionnaire.
- Seven-day PA recall questionnaire (sub sample used Actigraph)
- Seven-day PA. Actigraph (reported in methods but not in results)
- PA: Self-report SQUASH questionnaire
- PA: Self-report SQUASH questionnaire
### Table 1: PA primary outcome variables

<table>
<thead>
<tr>
<th>Follow-up (post-baseline)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>One, three and 6 months</td>
<td>Significant intervention effect for total PA at short-term and mid-term (145 mins/wk ± 146.2 vs 102 mins/wk ± 98.3). Trend at long-term (187 mins/wk ± 216.1 vs 133 mins/wk ± 216.8) but no longer significant. Interventions effects for meeting the guidelines non significant at short term but significant at mid-term (45% vs 18%) and long-term (42% vs 25%).</td>
</tr>
<tr>
<td>3 months</td>
<td>Significant intervention effect at midterm compared to general info (140.35 mins/wk SE 14.82 vs 98 mins/wk SE 15.09). Marginally significant intervention effect at midterm compared to targeted info (140 mins/wk vs 100 mins/wk, SD not reported, p=0.054).</td>
</tr>
<tr>
<td>6 months</td>
<td>Significant intervention effects at mid (print: 112.5 mins/wk; t-internet=120 mins/wk; s-internet =90 mins/wk) or long term (print: 90 mins/wk; t-internet=90 mins/wk; s-internet =80 mins/wk). Increased PA in all groups and no significant differences between groups.</td>
</tr>
<tr>
<td>12 months (6 months post intervention)</td>
<td>No significant intervention effects at mid (print: 112.5 mins/wk; t-internet=120 mins/wk; s-internet =90 mins/wk) or long term (print: 90 mins/wk; t-internet=90 mins/wk; s-internet =80 mins/wk). Increased PA in all groups and no significant differences between groups.</td>
</tr>
<tr>
<td>(6 months post intervention)</td>
<td>Significant intervention effects at mid-term for total PA (no difference between interventions: telephone = 123.32 mins/wk, SD =97.64; print = 129.49 mins/wk, SD =156.46; contact-control =77.67 mins/wk, SD =101.79).</td>
</tr>
<tr>
<td>12 months</td>
<td>Significant intervention effects at mid-term compared to general info (140.35 mins/wk SE 14.82 vs 98 mins/wk SE 15.09). Marginally significant intervention effect at midterm compared to targeted info (140 mins/wk vs 100 mins/wk, SD not reported, p=0.054).</td>
</tr>
<tr>
<td>(no post intervention measures)</td>
<td>No significant intervention effects at mid (print: 112.5 mins/wk; t-internet=120 mins/wk; s-internet =90 mins/wk) or long term (print: 90 mins/wk; t-internet=90 mins/wk; s-internet =80 mins/wk). Increased PA in all groups and no significant differences between groups.</td>
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<tr>
<td>(no post intervention measures)</td>
<td>No significant intervention effects at mid (print: 112.5 mins/wk; t-internet=120 mins/wk; s-internet =90 mins/wk) or long term (print: 90 mins/wk; t-internet=90 mins/wk; s-internet =80 mins/wk). Increased PA in all groups and no significant differences between groups.</td>
</tr>
<tr>
<td>3 months (during intervention; used to tailor final letter)</td>
<td>Significant intervention effects at mid-term compared to general info (140.35 mins/wk SE 14.82 vs 98 mins/wk SE 15.09). Marginally significant intervention effect at midterm compared to targeted info (140 mins/wk vs 100 mins/wk, SD not reported, p=0.054).</td>
</tr>
<tr>
<td>6 months (approx 3 months post intervention, respectively)</td>
<td>No significant intervention effects at mid (print: 112.5 mins/wk; t-internet=120 mins/wk; s-internet =90 mins/wk) or long term (print: 90 mins/wk; t-internet=90 mins/wk; s-internet =80 mins/wk). Increased PA in all groups and no significant differences between groups.</td>
</tr>
<tr>
<td>9 months (3 months post intervention)</td>
<td>Significant intervention effects at mid-term compared to general info (140.35 mins/wk SE 14.82 vs 98 mins/wk SE 15.09). Marginally significant intervention effect at midterm compared to targeted info (140 mins/wk vs 100 mins/wk, SD not reported, p=0.054).</td>
</tr>
</tbody>
</table>

### Results

#### PA primary outcome variables

- **Meeting CDC/ACSM criteria**
- **Meeting the recommendation for PA**
- **Total weekly days of moderate PA**
- **Meeting the recommendation for PA**

#### Follow-up (post-baseline)

- **One, three and 6 months**
- **12 months**
- **3 months**

#### Results

- Significant intervention effect for total PA at short-term and mid-term (145 mins/wk ±146.2 vs 102 mins/wk ± 98.3). Trend at long-term (187 mins/wk ± 216.1 vs 133 mins/wk ± 216.8) but no longer significant.
- Interventions effects for meeting the guidelines non significant at short term but significant at mid-term (45% vs 18%) and long-term (42% vs 25%).
- Significant intervention effect at midterm compared to general info (140.35 mins/wk SE 14.82 vs 98 mins/wk SE 15.09). Marginally significant intervention effect at midterm compared to targeted info (140 mins/wk vs 100 mins/wk, SD not reported, p=0.054).
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#### Effect size reported

- ES (mins/wk) small (0.35 at 6 months).
- Significant intervention effects at long-term for meeting the recommendation ($d = 0.14$) and total PA ($d = 0.15$).
- No difference between tailoring conditions (actions plans no additional effect).
<table>
<thead>
<tr>
<th>Methodological Quality</th>
<th>Moderate</th>
<th>Moderate</th>
<th>Moderate</th>
<th>Moderate</th>
<th>Moderate</th>
<th>Weak</th>
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<tbody>
<tr>
<td>Recruited via self referral</td>
<td>Recruited via self referral</td>
<td>Recruited via self referral</td>
<td>Recruited via self-referral</td>
<td>Recruited via self-referral</td>
<td>Actigraph data not reported</td>
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<tr>
<td>No intention to treat analysis with “moderately” scored withdrawal</td>
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<td></td>
<td></td>
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<td>*Sample size based on power calculation</td>
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</tr>
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<tr>
<td>Theory</td>
<td>TTM</td>
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<td>SCT</td>
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<td></td>
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<td>Self-determination theory</td>
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<td>Variables used for tailoring</td>
<td>SOC **</td>
<td>SOC **</td>
<td>SOC **</td>
<td>SOC **</td>
<td>Refers to Marcus et al 1998 , 2007a [40, 41]</td>
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<td>Key</td>
<td>Processes of Change **</td>
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<td>Self-efficacy **</td>
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<tr>
<td>Items were described *</td>
<td>Self efficacy **</td>
<td>Self efficacy **</td>
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<td>Processes of change**</td>
<td></td>
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<td>Social support-</td>
<td>PA score**</td>
<td>PA score**</td>
<td></td>
<td>Attitude-</td>
</tr>
<tr>
<td>No description -</td>
<td>Goal setting-</td>
<td>Social influence-</td>
<td>PA score**</td>
<td>(mins/wk)</td>
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<td>Self-efficacy-</td>
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<td>PA score**</td>
<td>Intention-</td>
<td></td>
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<td>Intention to implement action plans *</td>
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<td>Action Planning-</td>
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<td>PA score**</td>
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<td>PA score**</td>
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<td>plus condition:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>environment</td>
</tr>
<tr>
<td>Operationalised?</td>
<td>Yes</td>
<td>Yes, describes content per newsletter intext.</td>
<td></td>
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<tr>
<td>Examples of tailored messages given</td>
<td>Refers to Marcus et al 1998 [40, 2007a [40-41]</td>
<td>Determinants, theoretical methods, practical strategies provided as appendix</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Describes what content was based on (e.g. message differed based on self-efficacy and attitude) but not theoretical strategy.</td>
<td></td>
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</tr>
<tr>
<td>Delivery method &amp; delay</td>
<td>Mail within 1 week after baseline</td>
<td>Mailed within 1 week</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mail - time not described</td>
<td>Mailed within 2 weeks</td>
<td>Mail - time not described</td>
<td></td>
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</tr>
<tr>
<td>Format of materials</td>
<td>Tailored reports and stage based manuals</td>
<td>Tailored reports and stage based manuals</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>
| Tailored reports and stage based manuals | Tailored print and stage based manuals + general info about PA and tips for becoming active (to control for info available in internet arm) | Between 3-11 pages depending on changes in activity and determinants scores.  
**Plus condition:**  
+ maps, cycle routes, phone numbers of sports clubs, ebudy weblink  
Example layout given [45, 49]. |
| Tailored letters 5-11 pages | Cartoons, text and graphics |
| Content of Print Materials | Text with key messages highlighted | Generic information package: how to take your heart rate, buy walking shoes, proper walking posture.  
Tailored and targeted materials  
Tailored feedback based on psycho-social and behavioural variables  
Tailored feedback based on psycho-social and behavioural variables  
Descriptive: feedback based on assessment of constructs  
Progress feedback (third letter): progress made on PA and determinants since baseline. Improvements rewarded and possible |
| As in Marcus et al 1998 [40] | Tailored feedback based on psycho-social and behavioural variables (and environmental in the **plus** condition).  
Progress: progress made on PA. |
| Descriptive feedback: psycho-social variables | Tailored feedback based on psycho-social and behavioural variables  
Tailored and targeted materials  
Tailored feedback based on psycho-social and behavioural variables  
Progress feedback (third letter): progress made on PA and determinants since baseline. Improvements rewarded and possible |
| Descriptive | Descriptive: feedback based on psycho-social and behavioural variables  
Tailored feedback based on psycho-social and behavioural variables  
Tailored and targeted materials  
Tailored feedback based on psycho-social and behavioural variables |
| Comparative | Tailored feedback based on psycho-social and behavioural variables  
Tailored and targeted materials  
Tailored feedback based on psycho-social and behavioural variables  
Progress feedback (third letter): progress made on PA and determinants since baseline. Improvements rewarded and possible |
| Progress | Descriptive feedback based on assessment of constructs  
Progress feedback (third letter): progress made on PA and determinants since baseline. Improvements rewarded and possible |
<p>| Comparative feedback: Scores compared to successful individuals | Progress: progress made on PA since last assessment. |</p>
<table>
<thead>
<tr>
<th>Deliver Schedule</th>
<th>baseline, 1m, 3m &amp; 6m</th>
<th>baseline, 1m, 3m &amp; 6m</th>
<th>Weekly for the first month. Biweekly for months 2 &amp; 3; monthly for months 4-6. No contact in month 7, 9 and 11. Bimonthly in months 8,10,12.</th>
<th>Monthly for 12 months (inferred)</th>
<th>2 weeks, 8 weeks, 14 weeks</th>
<th>Baseline, 3months, 6months</th>
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</thead>
<tbody>
<tr>
<td>Tailoring assessment period</td>
<td>Just prior to Baseline, 1m, 3m,6m</td>
<td>Just prior to Baseline, 1m, 3m,6m</td>
<td>Monthly</td>
<td>Monthly</td>
<td></td>
<td>Baseline (Tailored letters 1 and 2)</td>
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<tr>
<td>Interpretation of results based on theory?</td>
<td>Mediation analysis</td>
<td>No</td>
<td>SOC, Self-efficacy – mediator</td>
<td>Based on SCT, TTM and empirical research picked variables that should impact study outcomes. Included conceptual model [47]. Process measures discussed</td>
<td>Intervention mapping protocol used to develop intervention.</td>
<td>Goal setting and implementation intention theories</td>
</tr>
</tbody>
</table>
References


62. Vandelanotte, C., I. De Bourdeaudhuij, and J. Brug, Two-year follow-up of sequential and simultaneous interactive computer-tailored interventions for


70. Ashford, S., J. Edmunds, and D.P. French, What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic


73. Williams, S.L. and D.P. French, *What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour and are they the same?* Health Education Research, 2011. 26(2): p. 308-322.

Chapter 3

A quantitative synthesis of trials promoting physical activity behaviour change among post-treatment breast cancer survivors

Citation: Short C, James E, Stacey F, Plotnikoff R. A quantitative synthesis of trials promoting physical activity behaviour change among post-treatment breast cancer survivors. Submitted to Journal of Cancer Survivorship, April 2013.
3.1 Abstract

**Background:** Health outcome trials have provided strong evidence that participating in regular physical activity can improve the quality of life and health of post-treatment breast cancer survivors. Focus is now needed on how to promote changes in physical activity behaviour among this group. **Purpose:** This systematic review examines the efficacy of behavioural interventions for promoting physical activity among post-treatment breast cancer survivors. **Methods:** Behavioural intervention studies published up until July 2012 were identified through a systematic search of two databases: MEDLINE and CINAHL; and by searching reference lists of relevant publications and scanning citation libraries of project staff. **Results:** Eight out of the ten identified studies reported positive intervention effects on aerobic physical activity behaviour, ranging from during the intervention period to 6 months post-intervention. Only two studies reported intervention effect-sizes. The identification of factors related to efficacy was not possible due to the limited number and heterogeneity of studies included, as well as the lack of effect sizes reported. Nonetheless, an examination of the eight studies that did yield significant intervention effects suggests that 12-week interventions employing behaviour change techniques (e.g., self-monitoring, goal-setting) derived from a variety of theories and delivered in a variety of settings (i.e., one-on-one, group, home) can be effective at changing the aerobic physical activity behaviour of breast cancer survivors in the mid-to long-term. **Conclusion:** Behavioural interventions do hold promise for effectively changing physical activity behaviour among breast cancer survivors. However, future research is needed to address the lack of studies exploring long-term intervention effects, mediators of intervention effects and interventions.
promoting resistance-training activity, and to address issues impacting on validity, such as
the limited use of objective physical activity measures and the use of convenience samples.
3.2 Introduction

Due to earlier detection and advances in treatment, more and more women are surviving breast cancer each year [1]. Whilst improved survival is duly welcomed, breast cancer survivors are faced with both short and long-term health and psychosocial sequelae [2]. To improve the quality of life of breast cancer survivors and negate the associated health burdens and risks, effective health promotion approaches are required [3]. One promising cancer recovery approach is the promotion of regular physical activity.

Evidence from dozens of health outcome trials suggests that regular physical activity can address both the psychological and physiological burdens presented after breast cancer diagnosis and treatment [4-6]. Furthermore, observational research suggests that regular physical activity may also have an impact on survival, with breast cancer survivors who are active after treatment having a lower risk of cancer recurrence, co-morbidities and death from all causes compared to those who are less active, regardless of cancer stage [7-9]. In recognition of these benefits, detailed exercise prescription guidelines for cancer survivors have been published by professional bodies internationally [10-14]. Despite these recommendations, the majority of breast cancer survivors are not sufficiently active for health [15-18] and efforts to encourage regular physical activity are not a routine part of the cancer rehabilitation process in most centres [19-22].

Given that strong evidence now exists supporting the safety and efficacy of physical activity interventions for enhancing health outcomes [6, 23, 24], there is a need to direct attention to physical activity promotion strategies that can be delivered to survivors in an effective and sustainable way. Whilst supervised exercise programs of short duration were highly appropriate for establishing safety and assessing the impact of regular physical
activity on health outcomes (such as fatigue & quality of life), interventions that promote sustainable behaviour change are now required. To increase the likelihood of success, interventions should be based on empirical research evidence, and grounded in strong health behavioural theory [25, 26]. To inform this process, a detailed synthesis of the physical activity behaviour change literature specific to breast cancer survivors is required. Two comprehensive reviews related to this topic have already been conducted [6, 27]. However, neither provides a synthesis of studies exploring the efficacy of behavioural intervention strategies for promoting the adoption and maintenance of physical activity among those in the post-treatment phase. Rather, White et al [6] examined the potential for physical activity interventions to be translated into practice. Many of the studies included in the White et al review were highly controlled health outcome trials, designed to demonstrate the impact of regular physical activity on health outcomes, as opposed to behaviour change trials designed to promote changes in physical activity behaviour. Whilst it is becoming common practice to include behavioural support in physical activity interventions, evaluations of such trials provides very little insight into how to promote sustainable behaviour change if descriptions of behavioural strategies and behavioural outcomes are not reported or adequately described [28]. As such, it is not surprising that White et al conclude that many of the studies lacked external validity, hindering the translation of the interventions into practice. The review conducted by Spark et al [27] did focus on behavioural interventions but only maintenance of intervention effects were explored (studies not reporting post-intervention follow-ups were excluded) and furthermore, the included studies were not restricted to post-treatment breast cancer survivors (i.e., studies conducted on mixed cancer samples and breast cancer patients
undergoing treatment were included in the review). Whilst physical activity is a recommended cancer control strategy across all cancer-related time periods (i.e., pre-diagnosis to-end of life), physical activity for recovery, rehabilitation and health promotion is recommended among survivors in the period after treatment and prior to the development of a recurrence of cancer or death [29]. Therefore it is important to review the specific literature on the efficacy of behavioural interventions on both the adoption and maintenance of physical activity among post-treatment breast cancer survivors [11, 30]. The primary purpose of this review is to synthesize this literature and provide direction for future research. Given the known heterogeneity of behaviour change trials and the small number of studies conducted in this field, a qualitative synthesis of the literature is provided in this systematic review.

3.3 Method

Eligibility criteria

Studies were eligible for inclusion in this review if they: a) examined the efficacy of at least one behaviour modification intervention designed to promote physical activity (i.e., aerobic activity and/or resistance training) among adult post-treatment breast-cancer survivors; b) if they included either self-reported or objectively assessed physical activity behaviour change as a study outcome; and c) used an individual or cluster randomised controlled design. Interventions were considered to be a ‘behaviour modification intervention’ if they included at least one behaviour change strategy (e.g., goal-setting, self-monitoring, problem solving, health education; see Michie et al for taxonomy of behaviour change techniques relating to changing physical activity and healthy eating behaviours)
aimed at promoting enhanced physical activity behaviour [31]. Studies testing the efficacy of interventions targeting multiple behaviours (including physical activity) were included.

Studies were excluded if they: a) were published in a language other than English; b) reported the efficacy of a physical activity intervention that did not involve behaviour change techniques (e.g., a supervised exercise program with no intervention component targeting increased knowledge or skills); c) included mixed samples of cancer survivors (including breast cancer survivors) and did not report intervention effects specifically by cancer type; d) included breast cancer survivors still undergoing active treatment (i.e., surgery, chemotherapy, radiotherapy); or e) were available as a conference abstract only.

Initially, articles were assessed for eligibility by a single reviewer based on the study title and abstract. After this initial screening, one-third of full-text articles were assessed for eligibility independently by 2 reviewers using a purpose-designed screening tool (applying inclusion criteria hierarchically). Findings were compared and disagreements between reviewers were resolved by consensus. The remaining two thirds were screened by one reviewer using the screening tool.

**Search strategy**

Studies were identified through a structured electronic database search of all publication years (until July 2012) in MEDLINE, and CINAHL. The following search terms were used: *exercise (or physical activity or motor activity) and cancer (or neoplasms)* and *randomized controlled trial(s) (or controlled clinical trial, intervention studies, or clinical trial)*. Results were limited to articles published in the English language and studies conducted among humans. Reference lists of relevant articles, identified reviews and files
of project staff were also scanned to check for studies not identified via the electronic search process.

**Data extraction**

The abstraction form for the Guide to Community Preventive Services [32] was used as a template for article abstraction [Appendix 2.2]. This tool includes questions about study design and execution, number and characteristics of participants, participant recruitment, and details of the intervention (such as theoretical underpinning, dose of physical activity and non-physical activity components). Tables of study descriptions and outcomes were developed and reviewed by a second study investigator for completeness and accuracy.

Follow-up periods were divided into three categories: short (< 3 months post intervention), medium term (3-6 months post intervention), and long term (> 6 months post intervention). Key methodological quality of each study was assessed independently by two reviewers using the McMaster quality assessment tool for quantitative studies [Appendix 1.2] developed by the Effective Public Health Practice, Canada [33]. Findings were compared and disagreements between reviewers were resolved by consensus.

### 3.4 Results

**Study Selection**

The initial search of the electronic database yielded 1397 publications, which were reduced to 347 following the review of study titles and abstracts. After removing duplicates and reviewing full-text articles using a purpose built screening tool [Appendix 2.1], nine
trials [34-50] (published in 17 articles) met the eligibility criteria. Checking project staff files identified one additional paper [51]. Reference checking did not yield any additional papers (see Figure 3.1 for PRISMA diagram summarising the selection process).

Figure 3.1: PRISMA flow diagram summarising selection process
**Trial characteristics**

An overview of the studies included is provided in Table 3.1 (at end of chapter). Five of the ten included studies specified physical activity behaviour change as a primary outcome [38, 40-42, 51]. Primary outcomes in the remaining studies were physical performance [34], quality of life [36], feasibility [37], and weight loss [39]. Most studies focused on promoting regular participation in moderate-vigorous aerobic physical activity, and only one study focused on promoting resistance-training [35]. Seven studies focused on the promotion of physical activity alone [34, 36, 38, 40-42, 51], whilst the remainder promoted physical activity and at least one other behaviour (e.g., diet) [35, 37, 39]. Self-report measures were used in all studies, but four studies also included an objective measure of aerobic activity [38, 40-42]. Trial participants were predominately recruited via advertisements, and invitations sent via cancer care centres or treating oncologists/surgeons. Two studies recruited participants via cancer registry [35, 42]. Eligibility criteria differed between studies in regards to time since active treatment and cancer stage. Three studies targeted survivors who had recently completed treatment [36-38] (ranging from treatment completed within the last year to three years); three studies restricted participation to those within a certain number of years from diagnosis (i.e., within 5 years from diagnosis [40]; within 7 years from diagnosis [34]; and within 14 years from diagnosis [39]), and one study focused on survivors who were at the five-year survival mark [35]. The remaining studies did not restrict participation based on time since active treatment [41-42, 51]. Four studies excluded breast cancer survivors diagnosed with stage 0 breast cancer [38, 39, 41, 42], two studies included these survivors [37, 40], and four studies did not specify if stage 0 breast cancer survivors were included [34-36, 51]. Seven
of the ten studies identified excluded participants that were already active (although the criteria for ‘active’ differed between studies). With few exceptions [35, 42], study samples (N’s ranged between 36-404) were generally small and mainly consisted of middle-aged, overweight participants.

**Intervention characteristics**

*Delivery mode.* Six of the identified interventions included a face-to-face component [34-36, 38, 39, 41], consisting of either group sessions [34, 35, 39], individual sessions [36, 38] or a combination of the two [41]. Three of these interventions also included a home-based component (i.e. telephone counselling sessions [38, 39]; exercise prescription for home-based activity [41]). Four interventions were entirely home-based interventions delivered via distance [37, 40, 42, 51]. Two of these provided telephone counselling to participants complemented with print-materials [37, 40], one of which also provided a heart rate monitor [37], one was email-based and provided participants with access to an e-counsellor [51], and one provided participants with targeted print materials, a pedometer, or both of these materials [42].

*Operationalisation of theory.* Eight of the ten interventions were fully informed by a behaviour change theory and employed techniques related to the theory used. The Transtheoretical Model [52] was operationalised in four interventions [34, 36, 37, 40]; Social Cognitive Theory [53] was operationalised in three interventions [40, 42, 51]; and the Theory of Planned Behaviour [54] was operationalised in one intervention [42]. Of the two remaining interventions, one was guided by a theoretical construct (i.e., social support) [35] and one was atheoretical [39].
**Behaviour change techniques.** The most commonly employed behaviour change techniques were self-monitoring and goal-setting [34, 36, 38, 40, 42, 51], eliciting social support [35, 36, 38, 41, 51] and positive reinforcement [34, 37, 40, 42]. Time management [41, 51], providing instruction [35, 42], cognitive reappraisal and consciousness-raising [36, 37] and positive role models [41] were also used in some studies.

**Comparison groups**

Five studies compared the efficacy of the intervention to a no intervention control [35, 37, 39, 38, 51]; Four studies compared the efficacy of the behaviour change intervention to a standard/usual care condition [34, 36, 41, 42]; and one study compared the efficacy of the intervention to a contact control condition [40].

**Methodological quality**

Findings from the methodological review are presented in Table 3.2. Based on the assessments by two reviewers (CS, FS) using a standardised tool [33], two of the studies were rated as ‘strong’ [40, 42], five of the studies were rated as ‘moderate’ [34, 37, 39, 41, 51], and three were rated as ‘weak’ [35, 36, 38]. Issues relating to selection bias (due to low consent rate and/or recruitment method) were considered a methodological limitation in eight studies, failure to report withdrawal and drop-out information was an issue in one study, and the reliability and validity of the measurement tool for assessing physical activity was considered an issue in two studies.
Table 3.2: Methodological quality of the included studies rated by two reviews

<table>
<thead>
<tr>
<th>First author, date</th>
<th>Selection bias</th>
<th>Study design</th>
<th>Confounders</th>
<th>Blinding</th>
<th>PA outcome assessment</th>
<th>Withdrawals and drop outs</th>
<th>Global rating</th>
</tr>
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<tr>
<td>Basen-Engquist, 2006</td>
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<td>-</td>
<td>Strong</td>
<td>Strong</td>
<td>Moderate</td>
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<tr>
<td>Pinto, 2005</td>
<td>Moderate</td>
<td>Strong</td>
<td>Strong</td>
<td>-</td>
<td>Strong</td>
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<tr>
<td>Rogers, 2009</td>
<td>Weak</td>
<td>Strong</td>
<td>Strong</td>
<td>-</td>
<td>Strong</td>
<td>Strong</td>
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</tr>
<tr>
<td>Mathews, 2007</td>
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<td>-</td>
<td>Strong</td>
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<tr>
<td>Vallance, 2007</td>
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<td>Strong</td>
<td>Strong</td>
<td>-</td>
<td>Strong</td>
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<tr>
<td>Hatchett, 2012</td>
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<td>Strong</td>
<td>Strong</td>
<td>-</td>
<td>Strong</td>
<td>Strong</td>
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<tr>
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<td>-</td>
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<td>-</td>
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<td>-</td>
<td>Strong</td>
<td>Strong</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

**Intervention effects on self-report and objectively assessed physical activity**

*Self-reported physical activity.* Significant intervention effects on self-reported physical activity behaviour change were reported in eight [35, 36, 38-42, 51] out of the ten included trials, ranging from half-way through a 12-week intervention [39] to 9 month follow-up [40] (see Table 3.1). Of the five studies [35, 36, 40-42] that assessed self-reported behaviour change at a post-intervention follow-up, three reported maintenance of the intervention effect (two mid-term [35, 36]; one long-term [40,43]); whilst two reported that the intervention effect was not sustained (mid-term [41]; long-term [42]). Of the two studies that did not find a significant intervention effect on physical activity behaviour change [34, 37], one study found a positive intervention trend at post-intervention (p = 0.086); and both reported positive changes in motivational readiness for exercise, as well as significant positive changes in other outcomes targeted (i.e., physical performance and
bodily pain [34]; diet, emotional functioning, fatigue, and depression [37]). Both of these studies were pilot studies with small sample sizes (n = 60 [34]; n = 45 [37]) and may have been underpowered.

**Objective measures.** Significant intervention effects on objectively assessed physical activity behaviour change were reported in two [38, 41] out of the four studies that utilised an objective measure, ranging from the short-midterm. Interestingly, there was incongruence between the objective and self-report measures employed in all four studies. Namely, those that found significant intervention effects on objectively assessed physical activity (using accelerometers in both cases) [38, 41] did not report significant intervention effects on self-reported physical activity. Whereas, those that did not report significant intervention effects for objectively assessed (via pedometers [42]; or accelerometers [40]) physical activity, did report intervention effects for moderate-vigorous self-reported physical activity.

**Effect sizes.** Only two studies reported intervention effect sizes. At the immediate post-intervention follow-up, effect sizes ranged from small to large, and were highest for objectively measured physical activity (large effect size reported for accelerometer assessed physical activity, $d = 1.02$, [41]; medium effect size reported for pedometer assessed physical activity, $d = 0.62$ [40]; small-medium effect sizes reported for self-reported physical activity, $d = 0.16$ [41]; $d = 38$[42] ). Effect sizes were not reported for post-intervention follow-ups in either of these studies.
Evaluation of factors impacting on intervention efficacy

The ability to identify and evaluate factors relating to intervention efficacy is limited due to the relatively small number of studies conducted, the heterogeneity of the studies included in terms of the interventions delivered and methodological characteristics, and the absence of effect sizes measures in all but two studies. Nonetheless, an examination of the eight studies that did yield significant intervention effects suggests that 12 week interventions employing behaviour change techniques (e.g., self-monitoring, encouraging social support, goal-setting, providing instruction) derived from a variety of theories and delivered in a variety of settings (i.e., one-on-one, group, home) can be effective at changing the physical activity behaviour of breast cancer survivors immediately after the intervention, with some evidence of maintenance in the mid-long-term. Furthermore, as there were few differences between the two studies that did not achieve significant changes in physical activity versus those that did, it may be likely that differences in effect were due to power issues rather than differences in intervention characteristics, especially in the trial that found a positive trend (n = 45) [37].

Mediators of intervention effects

Only three studies conducted mediation analyses [48-50] to examine the effect of the intervention on the theoretically-derived predictors of behaviour change, and to determine if PA was mediated by changes in these variables. Pinto et al [40] found that the positive intervention effect for their home-based intervention, based on the Transtheoretical Model [52], was not mediated by changes in Transtheoretical construct variables [48]. Whereas, positive intervention effects in Rogers et al [41, 49] Social Cognitive Theory-
based intervention and Vallance et al [42, 50] Theory of Planned Behaviour-based intervention were mediated by changes in the associated theory-based predictors. Namely, in Rogers et al study [41, 49] barriers interference mediated 39% (p = .004) of the intervention effect on PA 3 months post-intervention; and in Vallance et al study [42, 50] planning and intention were found to partially mediate the effects of the intervention on PA immediately following the 3 month intervention, as well as at 3 months post-intervention.

3.5 Discussion

The primary purpose of this review was to synthesize the existing literature relating to the efficacy of behaviour change interventions for promoting physical activity among post-treatment breast cancer survivors and to provide direction for future research. The review shows that while very few trials have been conducted in this domain, behavioural interventions of various intensities and delivery modes do hold promise for effectively changing aerobic physical activity behaviour among breast cancer survivors. Of interest to public health researchers and practitioners, one can envisage that several of the efficacious interventions described here could potentially be disseminated in a sustainable way to the increasingly growing population of breast cancer survivors [55]. However, there are gaps in the research to date that need to be addressed to fully inform public health approaches in this area.

First, empirical evidence regarding the ability of these interventions to be adopted, implemented and maintained at an individual and community level is required [55, 56]. Our findings mirror those of Spark et al [27], who concluded that the majority of studies targeting physical activity among breast cancer survivors do not report maintenance
outcomes of the intervention, and few report sustained intervention effects. Furthermore, the majority of studies do not include objective measures of behaviour change. Our findings also mirror those of White et al [6], who concluded that studies targeting physical activity amongst breast cancer survivors often report outcomes at an individual level (e.g., physical activity outcomes) but not at a setting or organisational-level (e.g., adoption, implementation and maintenance of intervention by study staff and key stakeholders). This lack of information at both an individual and settings level hinders the validity of the interventions and must be addressed to progress the translation of research into practice. A well-regarded framework for evaluating the external validity and public health impact of health promotion interventions is the RE-AIM framework [57]. The framework consists of five dimensions (i.e., reach, efficacy, adoption, implementation, and maintenance) that occur at multiple levels (e.g., individuals, organisation, and community) and interact to determine the public health impact of the intervention. The guiding premise is that failure to adequately evaluate programs on all five dimensions can lead to a waste of resources, discontinuities between stages of research, and failure to improve public health [55-57]. This would suggest that one direction for future research is to evaluate these interventions at the organisational or community level, using objective measures where possible.

Second, whilst the majority of studies included in this review were theory-based, only three tested the mediating role of the theoretical constructs (targeted by the intervention) on physical activity behaviour. Such analyses are needed to provide insight into ‘why’ interventions work, and hence accelerate the identification of effective behaviour change techniques and the development of evidence-based practice in the field applied [58]. Interestingly, Spark et al reported that interventions relying less heavily on a
theoretical model for intervention development and reporting the use of fewer behavioural intervention strategies seemed to be more likely to achieve successful maintenance of intervention effects. This was not observed in the current review, and furthermore is in direct contrast to current wisdom regarding the necessity of using theory in the development and evaluation of behavioural interventions [25, 26, 30, 59] and a growing body of evidence suggesting that theory-based interventions are more effective than a-theoretical interventions [60]. As such, we concur with the authors that this finding should be interpreted with caution. One possible explanation is that the results were skewed by the inclusion of health outcome trials that have a behavioural component. Such trials tend to be less reliant on theory than traditional behaviour change trials but in turn are more highly controlled and highly resourced, which may promote greater maintenance of intervention effects [28]. Hence, it is recommended that the development and evaluation of future interventions continue to be based on sound behavioural theory. Without such understanding, the development of effective interventions targeted at this population is likely to be hindered by ‘wheels’ being reinvented rather than re-applied [58].

Third, information regarding the efficacy of computer-mediated physical activity interventions in this population group requires further investigation [55]. Only one study included in this review evaluated the efficacy of a computer-mediated intervention and no mid or long term follow-up occurred [51]. Computer mediated interventions have shown promise in other population groups [61, 62] and may be particularly translatable in chronic disease setting [63], where several stakeholder already have a strong online presence (e.g., The American Breast Cancer Foundation, The Breast Cancer Network; The Cancer Council). In line with this, a review of chronic illness management interventions using the
RE-AIM framework [55] concluded that whilst traditional face-to-face intervention modalities are often efficacious they may have limited impact if they cannot be delivered consistently to large segments of the target population. Whereas, interventions using new information technologies may have greater reach, adoption, implementation and maintenance, and thereby greater public health impact. Exploring this research avenue further in the breast cancer population may enhance our ability to provide cost effective and sustainable supportive cancer care.

Fourth, only one of the trials included in this review focused on promoting behavioural changes in resistance-training and the efficacy of the intervention for changing this behaviour was not reported [35]. This is of concern, given that resistance-training is a recommended exercise for breast cancer survivors [10-12], and levels of resistance-training tend to be low if not non-existent in this group [64]. There is also evidence that targeting prolonged sedentary behaviour (e.g., sitting) may be an important component of overall daily activity that should also be addressed in behaviour interventions targeted at breast cancer survivors [9, 16]. One study using an objective measure of physical activity and sitting time showed that reducing sitting time among breast cancer survivors may assist with weight management and improve other metabolic outcomes [16]. In addition, a recent systematic review concluded that sedentary behaviour was associated with increased cancer risk for some cancers and cancer mortality among women [9]. To our knowledge, only one study has targeted aerobic and resistance-training as well as sedentary behaviour among breast cancer survivors [65]. The results from this study are forthcoming and may provide some useful information. Whilst studies exploring the efficacy of interventions for changing resistance-based activity and sedentary behaviour are needed, whether or not
interventions should focus on multiple aspects of a physical activity behaviour (e.g., diet and resistance-training), or indeed multiple behaviours is still unclear in the behaviour change field at large [66]. There is a growing recognition that such interventions have a greater potential to impact public health, but there is uncertainty as to whether targeting multiple behaviours may be overwhelming for participants [66]. Due to the small number of studies in the current review, it was not possible to examine if efficacy for changing physical activity differed based on whether the intervention was a single or multiple behaviour change intervention. Research examining the relative efficacy of interventions targeting multiple behaviours (e.g., nutrition and physical activity) and multiple aspects of behaviour (e.g., resistance-training, aerobic activity and sedentary behaviour) compared to those targeting single behaviours or single aspects of behaviour are needed to inform future public health practice.

Although this is a comprehensive review of the published literature, there are some limitations that may impact on the generalisability of the findings. Namely, the small number of studies included; the lack of quantitative synthesis; the exclusion of papers not published in English; the methodological weaknesses identified in the included studies (most commonly selection bias) and the possibility of publication bias, since grey literature (i.e., unpublished studies) were not examined. However, it should be noted that protocol papers were screened in an attempt to identify grey literature and reduce publication bias, and only one protocol paper fitting eligibility criteria was identified and authors were still at the data collection stage [65]; a qualitative synthesis of the literature was a more appropriate approach under these circumstances than a quantitative approach (i.e., a meta-analysis) due to the heterogeneity and small number of studies conducted in this field [67],
and the samples in the included studies reflected the heterogeneity of the breast cancer survivor population. Despite the aforementioned limitations, this review provides insight into the state of the evidence and highlights gaps and limitations in the literature and provides key directions for future research.

In conclusion, although few studies have been conducted examining the efficacy of behavioural interventions for promoting physical activity behaviour change, the majority of studies conducted to date have been of fair methodological quality, have produced changes in physical activity behaviour, and may be translatable into sustainable and cost-effective public health approaches. Hence, whilst the field is still in its infancy [3] the results of this review are promising and hope to guide future research.
<table>
<thead>
<tr>
<th>First author, date</th>
<th>n</th>
<th>Sample description</th>
<th>Intervention length</th>
<th>Delivery mode</th>
<th>Outcomes targeted</th>
<th>Intervention intensity</th>
<th>Theoretical models</th>
<th>Comparison group</th>
<th>PA outcome</th>
<th>Post baseline Follow-up</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basen-Engquist, 2006</td>
<td>60</td>
<td>Sedentary breast cancer survivors; within 7 years of diagnosis</td>
<td>6 months</td>
<td>Group</td>
<td>PA</td>
<td>90 minute group meetings each week for 16 weeks, and every other week for 8 weeks (21 sessions)</td>
<td>Transtheoretical model</td>
<td>Standard care condition</td>
<td>Mins/per week MVPA</td>
<td>6 months</td>
<td>Immediate: No significant difference between groups (p = 0.73)</td>
</tr>
<tr>
<td>Bloom, 2008</td>
<td>404</td>
<td>Breast cancer survivors under 50 years old, 5 years from diagnosis</td>
<td>12 weeks</td>
<td>Group</td>
<td>Knowledge, Aerobic PA, Resistance-training, Diet, Communication with family</td>
<td>Three monthly workshops conducted on Saturdays and lasting for 6hs, including exercise demonstrations. Topics: importance of weight-bearing physical activity, physical activity prescription, overcoming barriers, 30 minute session with stretch bands.</td>
<td>Conceptual framework based on theoretical construct – social support</td>
<td>Wait-list control group</td>
<td>Amount of PA was measured by indicating on a scale from 0 (never) to 4 (frequently) how often in the past month, while not on the job, participants engaged in certain aerobic, flexibility, and strength training activities. Sum of items, weighted by METS to obtain a total.</td>
<td>6 months</td>
<td>Mid-term: significant intervention effect on total physical activity (p = 0.04).</td>
</tr>
<tr>
<td>Daley, 2007</td>
<td>108</td>
<td>Sedentary breast cancer survivors; completed treatment within the last 12-36</td>
<td>8 weeks</td>
<td>One-on-one</td>
<td>PA</td>
<td>One-to-one sessions with an exercise specialist</td>
<td>Transtheoretical model</td>
<td>Usual care control</td>
<td>1–item, assessing how often they participate in 1+ physical activities for 20-30 minutes per sessions in free time over last 8 weeks</td>
<td>24 weeks</td>
<td>Immediate: Significant intervention effect of the exercise therapy group compared to the usual care control (p&gt;0.01). Mid-term:</td>
</tr>
<tr>
<td>Study</td>
<td>Participants</td>
<td>Duration</td>
<td>Intervention</td>
<td>Behavior Measurement</td>
<td>Control Group</td>
<td>Effect</td>
<td>Notes</td>
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<tr>
<td>Hatchett, 2012</td>
<td>Sedentary breast cancer survivors</td>
<td>12 weeks</td>
<td>Email PA</td>
<td>Social Cognitive Theory</td>
<td>Control group</td>
<td>Days of moderate physical activity (lasting 30 minutes)</td>
<td>Immediate: Significant intervention effect of the email group compared to the control group at 12 weeks for moderate (p &lt; 0.01) and vigorous intensity activity (p &lt; 0.01).</td>
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<tr>
<td>Kim, 2011</td>
<td>Sedentary breast cancer survivors; within two years of diagnosis of stage 0-III breast cancer</td>
<td>12 weeks</td>
<td>Telephone Print Aerobic PA Diet</td>
<td>Transtheoretical model</td>
<td>Control group</td>
<td>Not specified</td>
<td>Immediate: Trend in favour of the intervention but no significant difference between groups (p = 0.08)</td>
<td></td>
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<tr>
<td>Mathews, 2007</td>
<td>Sedentary breast cancer survivors; diagnosed with stage I-III breast cancer;</td>
<td>12 weeks</td>
<td>One-on-one Telephone Aerobic PA</td>
<td>Social cognitive theory</td>
<td>Wait-list</td>
<td>MET-h/week Ct/min/day (accelerometer)</td>
<td>Immediate: Significant intervention effect on Ct/min/day (p = 0.01). No intervention</td>
<td></td>
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<tr>
<td>Study</td>
<td>Year</td>
<td>Sample Description</td>
<td>Intervention Duration</td>
<td>Intervention Details</td>
<td>Control Group</td>
<td>Assessment Details</td>
<td>Effect on MVPA</td>
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<tr>
<td>Pakiz, 2011</td>
<td>68</td>
<td>Overweight breast cancer survivors, diagnosed with stage I-III breast cancer within the last 14 years</td>
<td>1 year</td>
<td>Aerobic PA Diet</td>
<td>None</td>
<td>Wait-list control</td>
<td>Early-mid intervention: significant intervention effect on hours of PA a week (p &lt; 0.05). PA not assessed post-intervention.</td>
<td></td>
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<tr>
<td>Pinto, 2005</td>
<td>86</td>
<td>Sedentary breast cancer survivors; diagnosed with stage 0 to II breast cancer over the last 5 Years;</td>
<td>12 weeks</td>
<td>Telephone Print</td>
<td>Transtheoretical model</td>
<td>Contact-control</td>
<td>Immediate: Significant intervention effect on MVPA (p = &lt;0.05) and meeting the physical activity guidelines (p = &lt;0.001). No sig intervention effect on Caltrac, Kcal (p = 0.36). Mid-long-term: Significant reduction in the intervention effect on MVPA three months after the intervention; effects at 6 months follow-</td>
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<tr>
<td>Study Reference</td>
<td>Sample Size</td>
<td>Characteristics</td>
<td>Intervention Duration</td>
<td>Group 1</td>
<td>Group 2</td>
<td>Theory of Behaviour</td>
<td>Social Cognitive Theory</td>
<td>Usual Care</td>
<td>Meeting PA Guidelines</td>
<td>Immediate Effect</td>
<td>Mid-term Effect</td>
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<tr>
<td>Rogers, 2009</td>
<td>41</td>
<td>Sedentary breast cancer survivors; diagnosed with stage I-IIIA breast cancer.</td>
<td>12 weeks</td>
<td>Group 1: One-on-one</td>
<td>Aerobic PA</td>
<td>6 discussion group sessions</td>
<td>Social cognitive theory</td>
<td>Usual care – provided publically available written materials</td>
<td>Meeting PA guidelines</td>
<td>Mins/per week MVPA</td>
<td>Activity counts (accelerometer)</td>
</tr>
<tr>
<td>Vallance, 2007</td>
<td>377</td>
<td>Breast cancer survivors diagnosed with stage I–IIIA breast cancer</td>
<td>12 weeks</td>
<td>Print Pedometer</td>
<td>Aerobic PA</td>
<td>Group 1 received a theory-based exercise guide for breast cancer survivors and the standard recommendation.</td>
<td>Theory of planned behaviour</td>
<td>Standard recommendation control (SR)</td>
<td>Mins/per week MVPA</td>
<td>Step-counts (pedometer)</td>
<td></td>
</tr>
</tbody>
</table>
Group 3 received all intervention materials.

Long-term intervention effect not maintained

*PA = physical activity, MVPA = moderate to vigorous physical activity
Conflicts of interest

All authors are involved in current trials that are potentially eligible for inclusion in this review.

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References


Part Two

Intervention development
Chapter 4

How Social Cognitive Theory can help oncology-based health professionals promote physical activity among breast cancer survivors

4.1 Abstract

Objective: The majority of post-treatment breast cancer survivors do not engage in physical activity at the recommended level. The promotion of physical activity among this group has the potential to dramatically improve quality of life and health outcomes. To maximise effectiveness, programs should be theory-based and address key determinants of physical activity behaviour. Social Cognitive Theory (SCT) has shown particular promise for developing and guiding physical activity interventions, but future research regarding how each SCT construct relates to physical activity among this group is needed. This study aims to explore how core SCT constructs impact on physical activity participation among post-treatment breast cancer survivors, and gain greater insights into how to shape physical activity program strategies that will be appealing and effective for this group. Methods. Post-treatment breast cancer survivors were recruited from the Breast Cancer Network Australia’s review and survey group. Semi-structured telephone interviews examined physical activity patterns and SCT constructs and were analysed thematically. Results. Eight post-treatment breast cancer survivors participated in the study. Changes in activity level since diagnosis were common; in most cases this reflected a decline in physical activity. Key social cognitive and environmental influences on physical activity were described under the following themes: knowledge, outcome expectations, self-efficacy and personal, behavioural and environment facilitators and inhibitors. Conclusion. The results of this study demonstrate the utility of SCT for guiding physical activity programs. Insight into how social cognitive factors may influence physical activity behaviour in this group is offered and direction for how oncology-based health professionals can promote physical activity among breast cancer survivors is provided.
4.2 Introduction

There is a steadily growing population of breast cancer survivors worldwide [1]. Unfortunately, for many women survivorship encompasses a significant level of burden and disability both initially and long after the treatment phase is complete [2]. This burden is not currently being addressed as a part of routine cancer care and many survivors have significant unmet needs [3-6]. Effective health promotion aiming to improve the quality of life and negate the health risks associated with survivorship among this group is needed.

One promising cancer control strategy is the promotion of regular physical activity [7, 8]. Physical activity can address both the psychological and physiological burdens presented after breast cancer diagnosis and treatment [9, 10]. Physical activity may also have an impact on survival, with a growing body of observational research indicating that breast cancer survivors who are active after treatment have a lower risk of cancer recurrence, co-morbidities and death from all causes compared to those who are less active, regardless of cancer stage [11-14]. In recognition of these benefits, detailed PA prescriptions guidelines designed to maximise outcomes for cancer survivors have been published by experts in the field [7, 8]. Previous research has shown that a recommendation to exercise from a health professional does lead to increases in physical activity among breast cancer survivors [15]. Unfortunately however, at present the vast majority of survivors do not receive any physical activity advice or support from their treatment team [3-6] and most do not engage in physical activity at a level sufficient to improve cancer outcomes [14, 16]. This may be due, at least in part, to the lack of evidence-based services that effectively promote regular and sustained physical activity among this group [8]. To support oncology-based health
professionals promote physical activity, programs offering physical activity advice and support to cancer survivors are needed.

There is a growing recognition that theory-based behaviour change interventions are more effective than atheoretical approaches [17]. Theories of behaviour change can help pinpoint what factors need to be considered before developing the program and can provide insight into how to shape program strategies to address these factors. Furthermore, theory-based interventions, unlike atheoretical approaches, can be tested in a way that provides information on how or why the intervention works. This increases the utility of the findings to others in the field and boosts the overall public health impact of the program [18, 19]. Hence, there is a strong rationale for designing physical activity programs for this group that are developed and implemented based on sound behavioural theories [20].

One theory that has shown particular promise in this field is Social Cognitive Theory [SCT] [21, 22]. SCT recognises the important dynamic and reciprocal relationship between behavioural, personal and environmental influences on behaviour, and offers ways of translating knowledge about these determinants into effective strategies for promoting behaviour change [22, 23]. According to Bandura [22], the core determinants that influence an individual’s behaviour include knowledge of the health risks and benefits (which is a pre-condition for change), self-efficacy (a person’s confidence in their control over performing a particular behaviour, which plays a central role in behaviour change), outcome expectations about the expected costs and benefits of performing the behaviour (which impacts on motivation), goals people set for themselves and their plans for achieving set goals (which provides self-incentive and guides action), and perceived facilitators and impediments to making behaviour changes, which can be behavioural, personal and/or environmental in nature [22].
Whilst SCT is a promising theory and has been used to guide effective interventions [24-27], the application of SCT to the promotion of physical activity among breast cancer survivors is still in its infancy [28]. For interventions to be evidence-based, further research is needed to explore what specifically should be addressed within each construct (i.e. to operationalise SCT for intervention development). For example, whilst the construct outcome expectations indicates that breast cancer survivors beliefs about the costs and benefits of participating in physical activity will impact on motivation, evidence is lacking regarding what specific outcome expectations may be particularly important to consider in this group [29]. Pioneering qualitative research by Rogers et al [29] has explored each SCT construct among breast cancer patients during the treatment phase, but no such studies have been conducted during the distinct ‘survivorship’ phase (the period following first diagnosis and treatment and prior to the development of a recurrence of cancer or death) [30, 31]. As physical activity promotion can help negate many of the burdens and risks associated with survivorship in this phase, it is important that attention is focused on the specific factors (within each SCT construct) that may impact on or be related to physical activity in this group so that they can be addressed.

The current study aims to address this knowledge gap by exploring SCT constructs among post-treatment survivors using a qualitative framework similar to Rogers et al [29]. The secondary aim is to synthesise this information in a way that will be useful for intervention developers and health practitioners working within oncology.
4.3 Method

Recruitment

English speaking women aged over 18 who had been diagnosed with breast cancer and who were not currently undergoing ‘active’ cancer treatment (defined as surgery, chemotherapy, radiotherapy) were eligible to take part in the study. There were no other exclusion or inclusion criteria. Before approaching potential participants an estimate of the required sample size needed to reach saturation was conducted [32]. Several factors known to impact on saturation were considered, including the scope of the study, the nature of the topic and the likely quality and amount of data obtained by each participant [33, 34]. As the present study builds on previous research, is narrow in scope and as high quality data is expected due to the sampling frame, it was predicted that a relatively small sample would be required. As a precaution, we aimed to recruit double the minimum sample size (i.e. at least six participants; Morse, 1994) recommended for qualitative research.

Participants were recruited from the Breast Cancer Network Australia’s (BCNA; www.bcna.org.au) review and survey group, which consists of over 800 volunteers that meet the study eligibility criteria. As a response rate of approximately 28% was expected (based on previous research with this sampling frame) no other sampling frames were considered. In an attempt to recruit twelve participants, forty four women were randomly selected and sent a study information pack and consent form by BCNA on behalf of the research team [Appendix 3.2; Appendix 3.3]. Information packs were re-sent two weeks thereafter to provide non-responders with the opportunity to take part in the study. Importantly, more invitations could be sent to other BCNA review and survey group members if requested by the research team. This was not necessary as theoretical saturation was reached after eight interviews.
Procedure

Semi-structured, telephone interviews were conducted and audio-taped. Telephone interviews were chosen over other interview methods due to the geographical dispersion of participants and evidence that this type of analysis can provide rich and detailed data [35, 36], comparable to the data obtained from in-person interviews [36] (viewed as the ‘gold standard’ for qualitative research [37]).

Prior to conducting interviews with participants, practice interviews were conducted with two consumer representatives (including a BCNA consumer advocate) to provide the interviewer with an opportunity to practice interview skills and refine the interview materials if necessary. All interviews were conducted by one researcher (CS) who holds behavioural science qualifications and has experience working with cancer survivors. Each interview ran for approximately 45 minutes.

Discussion guide

Interview questions exploring SCT constructs were adapted from Rogers et al [29] qualitative study among breast cancer patients undergoing treatment (see Table 2 in Rogers et al, 2004 for example questions) [Appendix 3.5]. Roger et al’s questions were based on Bandura’s original description of SCT [21], which included separate core constructs relating to several facilitators and impediments (i.e., environment, situation, observational learning, reinforcements, emotional coping responses). We adapted these questions to fit within Bandura’s updated framework (with fewer core constructs; i.e., knowledge, self-efficacy, expectations, goals, and facilitators and impediments) [22] and to be more appropriate for use with post-treatment breast cancer survivors (e.g. all references to activity ‘during treatment’ were removed). Example questions and a definition of each construct examined are provided in Table 4.1 Questions examining other factors of interest, such as demographics and cancer history were also included.
Physical activity behaviour was explored by asking participants ‘can you tell me a bit about how active you are?’ and prompts querying participants about time spent sitting, and pre-diagnosis activity levels.

Some changes were made to the original version of the discussion guide based on feedback from the practice sessions with consumer representatives. Specifically, the introductory section was reduced to limit participant burden, the order of the questions was restructured (physical activity questions moved to the front and cancer history questions moved to the back to allow participants time to settle in to the interview and build rapport with the interviewer before answering more emotionally difficult questions), and repetitive questions eliciting similar responses (e.g. ‘what would be required for you to participate in an exercise program’ and ‘what do you think it would take for you to increase your physical activity’) were identified and removed/adapted. The final version of the discussion guide was approved by the University of Newcastle Human Research Ethics Committee and a BCNA staff member before interviewing participants [Appendix 3.4].
Table 4.1: Example questions used in semi-structured telephone interview, adapted from [29, 38, 39]

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
<th>Example Question/s</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td>Knowledge of what PA to perform and possession of PA skills necessary to perform those activities</td>
<td>• What do you know about the PA recommendations for cancer survivors?</td>
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<tr>
<td><strong>Self-efficacy</strong></td>
<td>Confidence in ability to engage in PA (task self-efficacy) and to overcome barriers to PA (barrier self-efficacy)</td>
<td>• How successful do you think you could be in participating in regular PA?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Would you say that you are confident in your ability to perform regular PA?</td>
</tr>
<tr>
<td><strong>Expectations</strong></td>
<td>Expected effects of PA behaviour</td>
<td>• What is the first thought that comes to your mind when you think about PA?</td>
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<tr>
<td><strong>Goals</strong></td>
<td>Personal regulation of goal-directed PA behaviour, includes activities such as goal setting, self-monitoring, problem solving and self-reward</td>
<td>• Do you have plans to change your PA in the near future?</td>
</tr>
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<td></td>
<td></td>
<td>• Have you ever set a PA goal?</td>
</tr>
<tr>
<td><strong>Perceived facilitators and impediments</strong></td>
<td>Factors that influence (either positively or negatively) the PA behaviour of an individual</td>
<td>• What is the number one obstacle that interferes with your participation in PA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Do you have people in your life who encourage you to participate in PA?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Is your local environment a pleasant environment for being active in?</td>
</tr>
</tbody>
</table>

*PA = physical activity

**Data analysis**

Data collection and analysis were conducted between December 2010 and June 2011. Interview audio-tapes were transcribed verbatim by a research assistant. Participants were given the opportunity to read the interview transcript and edit any of the comments if they desired. Audio and text versions of the interviews were entered into the qualitative analysis software program, NVivo 9 [40], and analysed thematically using a theory driven code [41] (based on pre-existing descriptions of SCT constructs [22, 23], which reflected the main sections of the interview guide). Each response was reviewed line by line and considered in the context of the surrounding text. To ensure the trustworthiness of the categorised themes the first three interviews were coded.
independently by two members of the research team (CS, EJ). Results of the independent analyses were compared and discrepancies discussed until agreement was reached on thematic classification. The remaining transcripts were then coded independently by one of the coders (CS). An audit trail was kept of research design and data collection decisions, and the steps taken to manage and analyse the data using a notes page in NVivo 9.

4.4 Results

Participants

Eight of the forty four breast cancer survivors invited to participate took part in the study. A summary of participant demographic and behavioural characteristics is provided in Table 4.2. In brief, all participants were married and had undergone both surgery and chemotherapy treatments. Most had also undergone radiotherapy and were receiving, or had received, hormone therapy. Participants were diverse in terms of age (ranging from 44-66), work status, education level, location, time since treatment, and current PA behaviours (see Table 4.2). Most participants were undertaking some planned aerobic activity throughout the week, ranging from planned activity (i.e. walking) once a week, to regular planned sessions (i.e. walking, cycling, swimming, yoga). Two participants did not engage in any planned aerobic activity but reported regular incidental activity (i.e. walking at work). Most of the participants reported they had experienced a decline in physical activity levels since their diagnosis. For one participant this decline was experienced during the treatment period only and is now at pre-diagnosis levels. Only one participant reported that they have increased their physical activity level since being diagnosed.
Table 4.2: Participant Characteristics (n=8)

<table>
<thead>
<tr>
<th>Demographics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>Mean (range)</td>
<td>55 (44-63)</td>
</tr>
<tr>
<td>Marital status (count)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>8</td>
</tr>
<tr>
<td>Work status (count)</td>
<td></td>
</tr>
<tr>
<td>Full time</td>
<td>3</td>
</tr>
<tr>
<td>Part time</td>
<td>1</td>
</tr>
<tr>
<td>Casual</td>
<td>1</td>
</tr>
<tr>
<td>Retired</td>
<td>2</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>After high school</td>
<td>4</td>
</tr>
<tr>
<td>Parent status</td>
<td></td>
</tr>
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<td>Children</td>
<td>5</td>
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<tr>
<td>Grandchildren</td>
<td>1</td>
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<tr>
<td>Location (count)</td>
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</tr>
<tr>
<td>Major city</td>
<td>4</td>
</tr>
<tr>
<td>Regional area</td>
<td>4</td>
</tr>
<tr>
<td>Cancer history</td>
<td></td>
</tr>
<tr>
<td>Time since treatment (years)</td>
<td></td>
</tr>
<tr>
<td>Mean (range)</td>
<td>4 (3-6)</td>
</tr>
<tr>
<td>Treatment (count)</td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>8</td>
</tr>
<tr>
<td>Radiation</td>
<td>5</td>
</tr>
<tr>
<td>Hormone treatment</td>
<td>5</td>
</tr>
<tr>
<td>Physical activity (PA)</td>
<td></td>
</tr>
<tr>
<td>Current PA</td>
<td></td>
</tr>
<tr>
<td>No leisure time PA</td>
<td>2</td>
</tr>
<tr>
<td>Leisure time PA some days (cycle, walk)</td>
<td>3</td>
</tr>
<tr>
<td>Leisure time PA most days (swim, walk, yoga)</td>
<td>3</td>
</tr>
</tbody>
</table>
Themes from the theory-driven analysis are summarised here together with illustrative quotes from participants

Knowledge

None of the participants were aware of what specific physical activity they should be doing to optimise cancer recovery and/or prevent a recurrence. However, most were aware more generally that regular physical activity is recommended to stay well and one participant was aware of the importance of weight bearing activities to maintain healthy bones after cancer treatment. Participants reported obtaining this information themselves from the internet or written materials. None of the participants had been provided with specific physical activity advice about exercising post-treatment by anyone in their treatment team.

Mainly I just read about it in the little newsletter things that come around... that would be about the only information I get about how important exercise is and then if I go and look up on the internet they’ll generally say... but no medical people have ever mentioned it all. Doctors, surgeons, oncologist nobody! (Participant 1; 57 yrs old, 4 yrs post treatment).

Self-efficacy

Whilst confidence to engage in some form of regular physical activity was generally high in terms of skills, most participants identified factors or circumstances that would impede or restrict participation. These factors varied among participants, and included personal factors such as a lack of motivation, limitations in physical
functioning such as existing injuries and/or environmental factors such as the location and timing.

In the past I have been very successful. I certainly appear to be lacking a huge amount of motivation at the moment. (Participant 4; 58 yrs old, 4 yrs post treatment).

I could do it quite easily if I set it at a time to suit me. I’m not the sort of person who can join a gym, or go to a set class as a regular time because my working hours are too irregular for that. (Participant 3; 50 yrs old, 4 yrs post treatment).

Outcome expectations

The anticipated effects of participating in physical activity were predominantly positive. The most commonly anticipated benefits were enjoyment, increased energy, feeling good mentally and maintaining a healthy weight. Less frequently expressed positive expectations (although equally valued) were improvements in sleep, a sense of achievement, preventing cancer coming back, keeping bones strong, preventing chronic disease and fighting the aging process. For most participants, the immediate benefits of physical activity (e.g. being able to sleep better, having more energy) were the most salient motivators.

I don’t want to get diabetes and that sort of thing so the more exercise I do the better, but I think the thing that actually gets me out today more than
tomorrow is the fact that I need to get a good night’s sleep. (Participant 4; 63 yrs old, 3 yrs post treatment).

The majority of participants felt that there were no negative effects or costs of participating in physical activity that would impede their participation. Of exception however, one participant who was active prior to her diagnosis suggested that the mental costs of becoming active again were greater than any potential physical benefit, since being active did not prevent her from getting cancer in the first place.

I know in my mind how much it took, how much energy it took to get to that way of thinking last time. I don’t want to expend that sort of energy on just thinking about getting into the right frame of mind to do it. I’ve looked at life from the other side and I think “well, gee whiz, no one is going to care when I’m dead ‘wasn’t she a physically active person’ “ or “ ‘wasn’t she this’ “ or “ ‘wasn’t she that’ “. I’m doing things really for me, and that doesn’t necessarily include working into a lather of sweat on a treadmill or going around the block anymore. When I got cancer, I was the fittest that I have ever been. I think if I can get it when I’m really fit and strong and healthy, then I don’t think that exercise is actually going to keep me well. (Participant 4; 58 yrs old, 4 yrs post treatment).

Goals

Most of the participants had set some sort of physical activity goal for themselves in the past. For most participants, goal setting involved setting physical activity challenges for themselves whilst exercising and monitoring performance, rather
than focusing on increasing PA participation. For some, setting challenges during PA increased enjoyment and resulted in a feeling of achievement.

What I do is I time myself or I’ll try and out swim the guy next to me. I push myself in that way. (Participant 6; 51 yrs old, 6 yrs post treatment).

A sense of achievement in a way...I used to go around the lake and do this 5.5 kilometres and I actually got it down to 45 minutes or something when initially in took me 1 hour and 10 minutes and I set my own targets and that to me was an achievement. (Participant 5; 63 yrs old, 4 yrs post diagnosis).

Some participants did set goals and plan to increase the amount of physical activity they were undertaking but had difficulty maintaining the goal behaviour over the long term.

I thought that if I set a plan and set a goal and stuck to it I’d get fitter and lose a little bit of weight. I went all gung-ho at the start and then it just fizzled. I had my little time schedule down. I was going to do my walk every morning and then I was just going to do an extra half an hour...I guess one day something came up so I couldn’t do it so the next day I thought “oh I can’t be bothered” and then you kind of get back into the bad habit of going “oh I’ve run out of time, I’ve got to cook dinner etc. etc.”. (Participant 1; 57 yrs old, 4 yrs post treatment).
**Personal facilitators and impediments**

**Motivation**

For the majority of participants, a lack of motivation was the main obstacle stopping them from engaging in physical activity. Some women felt like motivation was the only real obstacle and that other barriers were really ‘excuses’.

(In response to the question ‘what is the number one obstacle that interferes in your physical activity?’) *Lack of motivation, because the thing is I sort of say I am very time poor, for much of the year. But at the same time, you always find time to do the things you want to do so I sort of think, to sort of say that I am time poor I think it’s an excuse* (Participant 2; 58 yrs old, 5 yrs post treatment).

For other women, a lack of motivation was compounded by other factors, such as health-issues, changes in perspective after cancer or not finding physical activity enjoyable.

*I think it’s (cancer) just sort of changed my attitude a bit, with working full time as well I find it harder to find the time, but I find that my energy levels are lower and therefore I tend to conserve my energy for the more the immediate things… I’m not going to say the more important things, ‘cause I think exercise is. But I you know, I do get tired a lot more quickly than I used to* (Participant 5; 63 yrs old, 4 yrs post treatment).
Health-issues

Health-related issues were identified by several participants as a key factor limiting their physical activity ability. Fatigue, arthritis, declines in physical functioning (relating to both age and cancer treatment), lymphedema and body pain were the key issues.

Since I finished chemo I get fatigued very very quickly. (Participant 3; 50 yrs old, 4 yrs post treatment).

Arimidex has unfortunately given me sore hips so an hour’s walking is really about it and then I go okay now we stop. (Participant 1; 57 yrs old, 4 yrs post treatment).

Behavioural facilitators and impediments

Reinforcement

Some participants spoke about intrinsic rewards, such as feeling good after meeting the challenges they set for themselves, but more commonly participants spoke about negative reinforcers facilitating exercise, such as feeling guilty for not exercising.

I can be very hard on myself when I don’t exercise. I get very guilty about it. (Participant 7; 55 yrs old, 3 yrs post treatment).

Environmental facilitators and impediments

Social Support

Social support was identified as an important motivator by the majority of
participants. For two participants, the most important aspect of social support was having someone to exercise with and the social rewards of participating in physical activity with others.

*That’s part of the reason for the walking group, it’s partly a social thing as well… it is getting out and talking to other people rather than just the kids (Participant 8; 44 yrs old, 5 yrs post treatment).*

For the rest of the participants, having an exercise partner or performing physical activity with others was not a key concern. Rather, social support in the form of encouragement or having someone to “answer to” appeared a more important motivating factor.

*I would say the biggest motivation for me would be somebody pushing or having to answer to somebody if my friend rang up and said ‘Right, have you done your hours exercise today?’ and tell you off if you don’t, that sort of thing. (Participant 1; 57 yrs old, 4 yrs post treatment).*

Exercise preference may have had an impact on the kind of social support most valued, as the majority of participants reported a preference to exercise alone.

*I would prefer to walk alone, because I find if I do walk with somebody else they walk too slow, ‘cause I’m a fast walker. (Participant 1; 57 yrs old, 4 yrs post treatment).*
The Local PA environment

Poor access to physical activity facilities was identified as a significant impediment. Several women reported that PA programs were either not available in their area or not available outside of work hours. The cost of attending physical activity facilities was also a barrier for some women.

There is nothing really close by either and that’s part of it, is having to get in the car and drive twenty minutes to go to somewhere. (Participant 8; 44 yrs old, 5 yrs post treatment)

I’ve always thought I’d enjoy Tai Chi, but again with working, the classes are held during the day and so that’s not possible. (Participant 2; 58 yrs old, 4 yrs post treatment).

The reason I don’t do it in like a gym or something is just the cost of going to the gym. (Participant 1; 57 yrs old, 4 yrs post treatment).

Local infrastructure and the surrounding area was also identified as having an impact on physical activity, with a lack of footpaths acting as an impediment for one participant and a pleasant physical activity environment acting as a facilitator for several participants.

The place we lived before it was a fifty-minute walk and it was terrific. I could walk up different streets and I wouldn’t have to go over the same ground twice, whereas here, where I live now you’ve sort of got to go out...
and back and yeah, I know it sounds funny and I know it’s probably just a
copout but there’s no footpaths. It’s just not the same and I just don’t
enjoy it. (Participant 2; 58 yrs old, 4 yrs post treatment).

I’m very fortunate where I live. I live across the road from a lake so I sort
of do a huge stretch of the road and I finish by walking the length of the
lake and coming home, so it’s a lovely walk. (Participant 7; 55 yrs old, 3 yrs
post treatment)

4.5 Discussion

This investigation into the application of SCT [22] among post-treatment breast
cancer survivors has built upon the previous work of Rogers et al (2004) and provided
some new insights into the potential social cognitive determinants of physical activity
within this group. Although additional population-based research is needed to explore
the generalisability of these findings to the growing breast cancer survivor population,
the current study serves as a useful building block for future research. The significance
of these findings are discussed below in the context of previous research, potential
intervention implications and the need for further investigation.

Building on previous research

Rogers et al (2004) examined the application of SCT to understanding exercise
behaviour among a sample of breast cancer patients undergoing cancer treatment.
Despite the marked difference in stage of cancer recovery between participants in the
current study and those in Rogers et al there was some overlap in how core SCT
constructs potentially related to physical activity behaviour in both groups. For
example, participants in both studies reported little knowledge about specific exercise
guidelines for cancer survivors, felt confident in their ability to perform aerobic exercise and had predominantly positive expectations about engaging in physical activity for general health benefits. Hence, our study supports Rogers’ recommendations that future exercise programs for the breast cancer population should include patient education to address knowledge gaps and should also emphasise the short-term benefits of activity most salient to the individual and the potential long-term cancer-specific benefits (such as improved survival) individuals may not be aware of to enhance motivation. However, there were also some differences between the findings that should be acknowledged. First, whilst the impediments reported by participants overlapped, issues differed in salience. For example, Rogers et al reported that fatigue was the most significant impediment to physical activity participation among patients, whereas participants in our study were more impeded by a lack of motivation, even though many reported significant health-related barriers. Second, patients in Roger’s study felt that specialised physical activity programs providing guidance by knowledgeable staff would help facilitate physical activity, whereas participants in the current study desired flexible programs that could be done in their own time. Whilst perhaps not surprising, these differences do suggest that addressing the preferences and needs of these two groups may require different interventions and intervention strategies. Third, Rogers et al (2004) explored the application of Bandura’s (1986) original SCT model. Although Rogers et al concluded that SCT is a useful framework for exploring exercise behaviours; some key findings relating to the breast cancer experience did not fit well within the model. For instance, Rogers et al suggested that some expansion of the constructs was necessary to recognise health-related barriers within the core construct of ‘environment’ and ‘self-efficacy’. In the present study, Bandura’s updated model (2004) of SCT was applied. We found that applying Bandura’s updated model [22] allowed for
the inclusion of these medically-related factors (that we agree should be included) under the broader heading of facilitators and impediments, without expanding the existing constructs. Hence, it seems that Bandura’s updated model may be a more useful and valid framework for exploring physical activity behaviour among individuals with a history of breast cancer. Social support was identified as an important facilitator of PA behaviour in the current study. This is not unexpected, as previous research has consistently highlighted the benefits of having an exercise partner and/or a strong support network (generally) on exercise behaviour [42, 43]. However, our findings suggest that appraisal support [44], such as offering encouragement and helping to monitor physical activity progress, may be an important aspect of social support to consider when developing PA intervention strategies. This may have particular benefit for those who prefer to exercise alone and are therefore less likely to benefit from or seek an exercise partner or group exercise option. To our knowledge, this aspect of social support has not been explored thoroughly among this population and warrants further investigation.

The period after a breast cancer diagnosis has been described as a ‘teachable moment’, whereby individuals are motivated to ‘take control’ by adopting healthy lifestyles [45, 46]. This notion has been supported by some previous research, indicating that the desire to take control (e.g. ‘maintain a normal lifestyle’ and ‘gaining control over cancer’) can motivate cancer patients to exercise [29, 47]. However, whilst some control taking behaviour was seen in our study, this did not always occur in the direction hypothesised. That is, some women ‘took control’ by choosing not to partake in physical activity and by choosing instead to participate in activities they enjoyed or that would conserve their energy. For these participants, the decision not to exercise seemed to be based on misconceptions about potential outcomes of physical activity.
This may be an example of reciprocal determinism, whereby outcome expectation violations (e.g. physical activity won’t keep me well because it didn’t prevent me from getting cancer) and/or misconceptions (e.g. engaging in any physical activity will exacerbate fatigue) interact with personal inhibitors of physical activity behaviour (e.g. fatigue, lack of enjoyment for physical activity). Hence, our findings underscore the need to address expectation violations and/or misconceptions regarding the impact of physical activity on cancer related outcomes and cautions that such misconceptions may drive ‘teachable moments’, whereby people ‘take control’ by deciding not to adopt health behaviours. This is a novel finding that may have significant intervention implications for those wishing to capitalise on the ‘teachable moment’.

**Implications for practice**

Although preliminary, the results of this study provide some new insights that may have implication for practice. First, this study highlights the need to address knowledge gaps relating to how much and what kind of physical activities are needed to produce health gains. In particular, breast cancer survivors would benefit from receiving an exercise prescription recommending participation in both aerobic and resistance-activities at a level sufficient to meet the guidelines for cancer survivors. This information is available in publications by professional bodies [7, 8]. Additional support for resistance training, addressing confidence (self-efficacy) to engage in resistance-based exercises may be required. Intervention approaches that are flexible and inexpensive, such as the provision of instructional print-material or DVDs or a session with a personal trainer are recommended. Second, the results also highlight the need for sensitivity when promoting physical activity among this group. Some survivors in the current study interpreted advice to exercise (provided by individuals in their social network) as pressure to ‘return to normal’. Care needs to be taken when giving advice
not to reinforce guilty or negative feelings that may already exist and to acknowledge
the breast cancer experience and associated barriers to exercise, especially when
describing the benefits of PA and when providing feedback on current behaviour. Third,
to encourage PA adoption and adherence, intervention strategies, locations and settings
should be attractive, accessible and appealing and be tailored to meet the preferences
and needs of individuals within the group. Hence, we recommend against a ‘one size
fits all’ approach and recommend multiple intervention options and support avenues be
made available.

To facilitate the development of SCT-based interventions targeting physical
activity behaviours among breast cancer survivors, an exemplar of how SCT can be
operationalised to promote physical activity among this group is presented in Table 4.3.
The operationalisation is based on the current study and previous research discussed
above. Where possible, we have suggested intervention techniques with known efficacy
for changing physical activity behaviour. For example, a recent review [48] concluded
that ‘action planning’, ‘providing instruction’ and ‘reinforcing efforts towards
behaviour’ were the most effective intervention techniques for increasing self-efficacy.
Otherwise, intervention techniques are adapted from suggestions by Baranowski [23].
This table offers a structural framework, which can be used to help guide the
development of evidence-based physical activity promotion resources for breast cancer
survivors. Adaptation of the framework may be needed for the development of
interventions targeting breast cancer survivors in developing countries.

**Strengths and limitations**

A potential limitation of this study is that our interviews were semi-structured,
which may be more likely to lead to prescriptive and leading questions. However, the
questions in this study were carefully planned and adapted from other published work to
avoid this problem and were considered necessary to gather the in depth information considered important for intervention development. Another potential concern may be the small sample size. However, as anticipated, a small sample size was adequate to reach saturation in this study. We defined ‘new information’ or a ‘new theme’ as one not identified in the current study or previously by Rogers et al (2004). This produced meaningful results that allowed us to proactively compare our findings with Rogers in the analysis phase and highlight issues that may be specific to the post-treatment phase.

The major strengths of this study are that it: (1) provides a greater understanding of the theoretical mechanisms of SCT as they relate to physical activity promotion among post-treatment breast cancer survivors; (2) directs some insight into how these mechanisms could be addressed in SCT-based interventions among this group; and, (3) offers information useful for the development of SCT construct measures, necessary for testing and strengthening SCT via population-based research.

Table 4.3: Social Cognitive Theory constructs and implications for intervention development

<table>
<thead>
<tr>
<th>SCT construct</th>
<th>Intervention implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Address knowledge and skill gaps, particularly in relation to PA guidelines and resistance-training</td>
</tr>
<tr>
<td>Outcome expectations</td>
<td>Promote benefits most salient to the individual (likely to be related to function or survival) and address misconceptions (e.g., PA no benefit to survival, PA will exacerbate lymphedema).</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Address factors impacting on both ability to engage in PA (aerobic and resistance-training) and PA barriers, such as health concerns and low motivation. Provide encouragement and iterative feedback to increase confidence.</td>
</tr>
<tr>
<td>Goals</td>
<td>Teach goal setting skills (e.g. action planning) and encourage self-monitoring, which is likely to increase enjoyment and feelings of achievement.</td>
</tr>
<tr>
<td>Facilitators and Impediments</td>
<td>Promote social support in a way that is meaningful for the individual and recognises PA preferences and ensure programs are flexible and accessible (e.g., a home-based program).</td>
</tr>
</tbody>
</table>
**Suggestions for future research**

Prior to the development of SCT-based interventions targeting physical activity behaviour among breast cancer survivors, future research exploring the generalisability of these findings in a representative population-based sample is recommended. Information regarding the prevalence of the social cognitive and environmental factors identified in the current study and in previous research will be particularly helpful and is necessary for the development of cost-effective public health approaches that target the most salient determinants of behaviour change.

Future exploratory research examining the application of SCT in other settings and/or among particular sub-groups of breast cancer survivors is also recommended. Findings from the current study may not be as applicable to very young or elderly breast cancer survivors or to those living in developing countries, as they were not represented in our sample. Hence, further examination of the social cognitive and environmental factors influencing physical activity in these groups is warranted.

Finally, we recommend that researchers develop measures of SCT constructs that reliably and validly capture the social cognitive and environmental influences of PA among breast cancer survivors. Such measures are necessary for capturing the prevalence of these factors in the breast cancer population and are also essential for testing and iteratively improving the ‘fit’ and strength of SCT to the application of physical activity behaviour change. We suggest, that in combination with Rogers’ work [29], this study can significantly inform this process.
References


Chapter 5

The theory and evidence-based development and evaluation of the *Move More for life* program: A tailored-print intervention designed to promote physical activity among post-treatment breast cancer survivors.

**Citation:** Short C, James E, Plotnikoff R. The theory and evidence-based development and evaluation of the *Move More for life* program: A tailored-print intervention designed to promote physical activity among post-treatment breast cancer survivors. Submitted to *International Journal of Behavioral Nutrition and Physical Activity*, Feb 2013 (Under editorial review)
5.1 Abstract

Objective. Several physical activity interventions have been effective in improving the health outcomes of breast cancer survivors. However, few interventions have provided detailed descriptions regarding how such interventions work. To develop evidence-based practice in this field, detailed descriptions of intervention development and delivery is needed. This paper aims to (1) describe the theory-and evidence-based development of the Move More for Life program, a physical activity program for breast cancer survivors; and (2) serve as an exemplar for theory-based applied research.

Method. The program-planning model outlined by Kreuter et al was used to develop the computer-tailored intervention. Results. Determinants of physical activity behaviour change among breast cancer survivors were identified and mapped against behaviour change techniques with known mediation effects or known efficacy for changing physical activity behaviour. Conclusion. The Move More for Life program is an example of a theory-based, low-cost and potentially sustainable strategy to physical activity promotion and may stand as an exemplar for Social Cognitive Theory-based applied research. By providing a detailed description of the development of the Move More for Life program, a critical evaluation of the working mechanisms of the intervention is possible, and will guide researchers in the replication or adaption and re-application of the specified techniques. This has potential implications for researchers examining physical activity promotion among cancer survivors and for researchers exploring distance-based physical activity promotion techniques among other populations.
5.2 Introduction

Breast cancer has the highest incident rate of any cancer among women in most regions of the world [1]. In developing countries, population-wide screening and the systematic use of adjuvant treatments has improved survival rates so that the majority of patients survive for at least 5 years following their diagnosis [1]. Whilst improved survival is duly welcomed, compared to the general population longer term survivors experience a survival deficit due to risk of recurrences, metastases and other chronic diseases [1]. Population health approaches aimed at reducing this survival deficit, as well as addressing other common physical and psycho-social issues experienced by survivors (e.g., reductions in quality of life, physical functioning and increased fatigue [2]) are needed.

One recommended approach is the promotion of regular physical activity [3]. The majority of breast cancer survivors are inactive or have difficulty maintaining activity levels over time [4, 5]. Over 70 health outcome trials have documented the benefits of sustained PA among breast cancer survivors [6, 7] and a growing body of observational research suggests that regular activity may also be a protective factor against poor survival outcomes, regardless of cancer stage [8-10]. Unfortunately, efforts to encourage regular PA are not yet a routine part of the cancer treatment or rehabilitation process [11-14] and population health approaches to promoting physical activity in this group are still needed [15, 16].

Previous research in primary prevention suggests that computer-tailored print interventions, which utilise technology to provide individuals with health messages and behaviour change advice that is matched to their personal characteristics, may be a useful tool for improving public health. Computer-tailored print interventions have been shown to be more efficacious than other print-based approaches [17] and can
personalise behaviour change advice at a relative low cost whilst maintaining wide reach, when compared to face-to-face interventions [16-18].

A major limitation of current research in the behaviour change field is the lack of scientific reporting regarding how interventions work. Current reporting typically focuses on ‘if’ and ‘how much’ the intervention works and has provided very little information regarding the theoretical basis of the intervention, the intervention techniques employed, and the links made between theoretical constructs and behaviour change techniques [19, 20]. In the tailoring field, this has contributed to what is known as the ‘black box of tailoring’ [21], whereby it is practically impossible to identify the working mechanisms of the intervention and build upon previous findings and methodologies. To address this issue, comprehensive guidelines have recently been published suggesting reporting standards for tailored interventions [21].

The current paper adheres to these reporting standards by describing the development and process evaluation of the Move More for Life intervention, a computer-tailored print intervention designed to promote physical activity among breast cancer survivors. The Move More for Life intervention was recently evaluated in a large Australian-based RCT with 330 post-treatment breast cancer survivors dispersed across the country. The current article aims to increase the public health impact of the Move More for Life intervention by offering insight into ‘how’ and for whom the intervention works, by providing sufficient detail to enable adaptation and/or replication of the intervention, and by providing recommendations for future research. Given the promise of computer tailored interventions for physical activity promotion [17] and the relatively high development time of these complex interventions, the information presented in this paper will accelerate the development process for other researchers developing similar
interventions and reduce the likelihood of ‘reinventing the wheel’, which occurs all too often in the behaviour change field [21].

5.3 Methods and results

The intervention was developed using the 9-step program-planning model outlined by Kreuter et al [22] (see Table 5.1). In brief, the 9 steps include: (1) analysing the health problem; (2) developing a program framework; (3) developing the tailoring assessment; (4) designing feedback; (5) writing tailored messages; (6) creating tailored algorithms; (7) automating the tailoring process; (8) implementing the program; and (9) evaluating the program. Actions undertaken in each step are described below.

Table 5.1: The nine-step tailoring process (adapted from Kreuter et al [22])

<table>
<thead>
<tr>
<th>Process</th>
<th>Aim of step</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Analysing the health problem</td>
<td>Understand the determinants of physical activity behaviour change</td>
</tr>
<tr>
<td>2. Developing a program framework</td>
<td>Outline the program “blue print” and develop a detailed description of each intervention component</td>
</tr>
<tr>
<td>3. Developing tailoring assessment</td>
<td>Develop assessment to measure participants status on key determinants</td>
</tr>
<tr>
<td>4. Designing feedback</td>
<td>Specify the design characteristics of the tailored material</td>
</tr>
<tr>
<td>5. Writing tailored messages</td>
<td>Outline unique characteristics of each message and write the tailored messages</td>
</tr>
<tr>
<td>6. Creating tailored algorithms</td>
<td>Link the specific responses to each assessment question with the corresponding message using logic statements – e.g. “if this, then that”</td>
</tr>
<tr>
<td>7. Automating the tailoring process</td>
<td>Assemble the computer program that generates tailored feedback</td>
</tr>
<tr>
<td>8. Implementing the program</td>
<td>Produce accurate and timely tailored feedback</td>
</tr>
<tr>
<td>9. Evaluating the program</td>
<td>Evaluate process, impact and outcome of the tailored program</td>
</tr>
</tbody>
</table>
Step 1: Analysing the health problem

Reviewing applicable theories and models

The Theory of Planned Behaviour (TPB; [23]) and Social Cognitive Theory (SCT; [24, 25]) were identified as the most popularly applied theoretical models to physical activity promotion in cancer survivors. Both of these theories have shown to be useful frameworks for understanding the physical activity behaviour of cancer survivors [26], and there is evidence from meta-analyses that the use of these theories improves tailored-print health behaviour change intervention efficacy [27] and efficacy in psycho-oncology interventions [28].

Selecting theoretical framework

SCT was considered the most useful framework for informing the Move More for Life intervention for the following reasons: 1) a direct comparison of the two theories (in a non-diseased population) demonstrated that SCT accounted for greater variance in physical activity behaviour than TPB, mainly due to the predictive validity of self-efficacy [29]; 2) self-efficacy, a key construct in SCT, has shown to be an important correlate of physical activity in breast cancer survivors [30-32]; 3) interventions that utilise a greater number of SCT components have larger effect sizes than studies with fewer SCT components [28]; 4) previous research has shown that there is variability in breast cancer survivors scores on SCT constructs [33], which is a necessary criteria for tailoring; and, 5) unlike other models of health behaviour that are mainly concerned with predicting health habits, SCT offers both predictors and principles on how to inform, enable, guide, and motivate people to adopt habits that promote health [25]. The key constructs of SCT (adapted from [34]) are described in Table 5.3.
Reviewing previous literature

Reviews of computer-tailored interventions [27, 35] provide strong support that tailored interventions are most effective when tailored using a mixture of: (1) social cognitive constructs; (2) demographic variables and (3) actual behaviour scores. In addition, audience segmentation research in the physical activity domain [36] suggests that broader health status factors beyond actual health behaviour (e.g., co-morbidities, level of disability) may also be important to consider when intervening in a tertiary prevention setting. That is, audience segmentation appears to be most worthwhile when psycho-social and health status factors are combined together with demographic variables (which understandably have limited ability to distinguish between people in chronic disease groups but which ultimately enhance receptivity to and acceptance of health messages) [36].

Based on this information, we conducted a synthesis of the literature to: (1) identify which demographic and health behavioural variables should be targeted; and, (2) determine any social cognitive variables (either included or not included in SCT) that may be important to target in the intervention. Studies were identified through an electronic database search of all publication years (until Jan 2011) in Medline and Google Scholar, using combinations of the following search strings: (Physical activit* or exercise) AND (correlate or determinant or mediator or moderator or intervention) AND (cancer survivor or breast cancer). Overall, we found there was limited research examining the determinants of physical activity behaviour change among cancer survivors. The majority of the studies identified were cross sectional (n=20), with few longitudinal (n=5) or intervention studies (n=7) included. A summary of the findings are presented in Table 5.2. In brief, age, co-morbidities, weight status, and physical activity history were identified as potential factors that should be targeted for audience
segmentation, whilst self-efficacy, social support, intention, and outcome expectations were highlighted as potential social-cognitive determinants of physical activity behaviour change. There were no social cognitive variables outside of SCT that were identified as essential to be addressed in the intervention. There was evidence that personality factors impact on physical activity participation [37-39], but this was not considered sufficient to warrant adding further complexity to the audience segmentation process. There was also strong evidence that physical activity intentions should be targeted. We chose to operationalise intentions as ‘proximal goals’ to be consistent with the current conceptualisation of SCT [25].

Table 5.2: Summary table of literature exploring physical activity correlates and predictors among BCS

<table>
<thead>
<tr>
<th>Demographics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>(+) Cross-sectional. Higher income associated with increased PA [33].</td>
</tr>
<tr>
<td>Age</td>
<td>(+) Longitudinal. Younger age associated with lower PA post diagnosis [40].</td>
</tr>
<tr>
<td></td>
<td>(/) Cross-sectional. Age not associated with meeting the guidelines [41]</td>
</tr>
<tr>
<td></td>
<td>(/) Intervention study. Age not associated with exercise adherence. [42]</td>
</tr>
<tr>
<td>Education</td>
<td>(/) Intervention study. Education did not predict exercise adherence. [42]</td>
</tr>
<tr>
<td>Marital status</td>
<td>(/) Intervention study. Marital status did not predict exercise adherence. [42]</td>
</tr>
<tr>
<td>Health status</td>
<td></td>
</tr>
<tr>
<td>Co-morbidities</td>
<td>(-) Cross-sectional Higher co-morbidity associated with lower PA [41]</td>
</tr>
<tr>
<td>Weight</td>
<td>(+) Longitudinal. Normal weight pre-diagnosis associated with less PA post-diagnosis [40].</td>
</tr>
<tr>
<td></td>
<td>(-) Cross-sectional. Higher BMI associated with reduced likelihood of exercising [41].</td>
</tr>
<tr>
<td></td>
<td>Cross-sectional. Lower sense of exercise self-efficacy among women who were overweight [43]</td>
</tr>
<tr>
<td>HRQL</td>
<td>(+) Cross-sectional. Poorer HRQL was related to relapsing from active exercising to not exercising [44].</td>
</tr>
<tr>
<td></td>
<td>Longitudinal. HRQL (mental scale) significant predictor of rate of change of PA [45].</td>
</tr>
<tr>
<td>Fatigue</td>
<td>(-) Longitudinal. Fatigue associated with lower PA at baseline but not associated with rate of change in PA. [45].</td>
</tr>
<tr>
<td>Time since diagnosis</td>
<td>(/) Intervention study. Did not predict exercise adherence [42]</td>
</tr>
<tr>
<td>Stage of</td>
<td>(/) Intervention study. Did not predict exercise adherence [42]</td>
</tr>
<tr>
<td>Cancer</td>
<td>Social Cognitive</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Self-efficacy</strong></td>
<td>(+) Cross-sectional. Self-efficacy association with positive exercise changes [43]</td>
</tr>
<tr>
<td></td>
<td>Cross-sectional. Self-efficacy correlated with current PA levels independent of pre-treatment PA levels [31].</td>
</tr>
<tr>
<td></td>
<td>(+) Cross-sectional. Task self-efficacy highly predictive for both PA and exercise in the overall sample and in the subgroup of younger women. Barrier self-efficacy followed the same trend [41].</td>
</tr>
<tr>
<td></td>
<td>(+) Intervention study. Baseline self-efficacy significant predictor of mean minutes of weekly exercise and of meeting weekly goals. [42].</td>
</tr>
<tr>
<td><strong>Social support</strong></td>
<td>(+) Cross-sectional. Having an exercise partner or role model associated with increased PA [33].</td>
</tr>
<tr>
<td></td>
<td>(+) Longitudinal. Family support predicts change in PA behaviour [45].</td>
</tr>
<tr>
<td></td>
<td>(+) Cross-sectional. Perceived social support related to increases in PA after diagnosis, even up to give years later [46].</td>
</tr>
<tr>
<td></td>
<td>(/) Longitudinal. Social support of friend (not exercise specific) not a predictor of PA at baseline [45].</td>
</tr>
<tr>
<td><strong>Intention</strong></td>
<td>(+) Cross-sectional. Intention significantly predicted PA behaviour, [47].</td>
</tr>
<tr>
<td></td>
<td>Cross-sectional. Intention explained 35% of the variance in exercise adherence [48].</td>
</tr>
<tr>
<td><strong>Personality</strong></td>
<td>(+) Intervention study. Extraversion related to increased exercise [38].</td>
</tr>
<tr>
<td></td>
<td>(+) Cross-sectional. Neurotic breast cancer survivors more like to relapse [37].</td>
</tr>
<tr>
<td></td>
<td>(/) Cross-sectional. General locus of control unrelated to improvements in survivors PA [49].</td>
</tr>
<tr>
<td><strong>Perceived control</strong></td>
<td>(+) Cross-sectional. Outcome Expectations significant predictor of PA and exercise in [41].</td>
</tr>
<tr>
<td></td>
<td>(+) Mediation analysis. Positive beliefs about PA and cancer recurrence are related to increased PA levels [50].</td>
</tr>
<tr>
<td><strong>Outcome expectation</strong></td>
<td>(/) Cross-sectional. Decisional balance did not predict exercise adherence [51].</td>
</tr>
<tr>
<td><strong>Decisional balance</strong></td>
<td>(-) Longitudinal. Women reporting more PA pre diagnosis had lower levels of PA post diagnosis [40].</td>
</tr>
<tr>
<td></td>
<td>(+) Cross-sectional. Prior exercise was a significant positive predictor of overall PA [41].</td>
</tr>
<tr>
<td></td>
<td>Cross-sectional. Direct association with Pre-treatment PA level and current PA level [31].</td>
</tr>
<tr>
<td><strong>Physical activity behaviour</strong></td>
<td>(+) Intervention study. Baseline PA a significant predictor of mean minutes of weekly exercise [42].</td>
</tr>
<tr>
<td><strong>Pre-diagnosis PA level</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Collecting original data

After reviewing the literature, we felt it necessary to gather further information about the application of SCT in the target group to inform our operationalisation of SCT constructs and the appropriate selection of behaviour change strategies. We built upon Rogers et al’s [52] study with breast cancer patients and used a similar qualitative approach among post-treatment survivors. The findings of this research are described in detail elsewhere [53]. In brief, we found that motivation and health issues were the most common impediments for participating in regular physical activity. Among women who did participate, the immediate benefits of physical activity, such as weight loss and reducing fatigue were more salient motivators than preventing chronic disease. However, very few women were aware of the potential impact of physical activity on cancer recurrence. Participants demonstrated knowledge gaps in relation to what types of activity should be performed and how much activity is needed to achieve health benefits. Some women reported feeling pressured and judged when receiving physical activity advice. Preference for an exercise partner and the need for social support varied, with some women referring to themselves as ‘self-motivators’ and preferring to exercise alone and others stating that having someone to answer to was a primary motivating factor for them. Although this work is preliminary and greater investigation on a population level is needed, the findings helped us to understand how each SCT construct may relate to physical activity behaviour in the post-treatment breast cancer population and ultimately set the ‘tone’ of the intervention (i.e., how the messages were framed).
Step 2: Developing the program framework

Defining the program objectives

Program objectives were informed by the physical activity prescription guidelines for cancer survivors [54] and emerging evidence detailing the health risks associated with prolonged sedentary behaviour [5]. Specifically, the primary objectives of the program were to: (1) increase the total amount of minutes and days per week breast cancer survivors engage in health-enhancing physical activity (including aerobic and resistance-training) and: (2) promote maintenance of regular health-enhancing physical activity. The main secondary objective was to reduce the amount of time breast cancer survivors spend sitting in unbroken sedentary behaviour.

Defining program constraints

The project was constrained by a $52,000 (AUD) total project budget and a 3-year study timeline.

Designing the general program framework

Exploring factors impacting on intervention efficacy

The project team conducted a systematic review examining factors related to the efficacy of computer-tailored print interventions within the physical activity domain [17]. The findings of this review highlighted that the most effective interventions are those that contain multiple-contacts, are underpinned by theory or multiple theories (especially if the TTM [55] is used) and deliver print materials within 2 weeks of administering the tailoring assessment. Two relevant meta-analyses [27, 35] were also identified. Both provided evidence that multiple-contact interventions are more likely to be effective than single-contact interventions, especially when messages are iteratively
tailored (i.e., provide ongoing feedback based on updated participant data). One review [27] also provided evidence that tailored-print interventions delivered via newsletters have greater effect sizes than those delivered via other print mediums (e.g., booklets, letters). As such, we strived to develop a multiple-contact intervention that would offer iterative feedback and be delivered in a newsletter format.

Consulting with an expert advisory panel

One of the limitations of the tailoring literature is the lack of evidence regarding how many intervention contacts and at what frequency is optimal to facilitate behaviour change [17]. We formed an expert advisory panel to direct our decision making on these key aspects. The expert advisory panel consisted of a tailoring expert, an exercise physiologist specialising in breast cancer recovery, a consumer representative, and representatives from two breast cancer related support services. The key recommendations made by the advisory group were to ask participants directly what they find acceptable and to provide as many tailored materials as possible within the program constraints.

Exploring acceptability and program preferences among the target group

In line with the advisory group’s recommendation, the acceptability of the proposed intervention was explored qualitatively among the eight post-treatment breast cancer survivors participating in the aforementioned interviews [53]. Participants were provided with a description of what computer-tailored written advice is, and were asked to provide feedback relating to the perceived usefulness of the intervention, interest in the intervention type and their preferences for number of contacts and intervention length. The key themes identified are summarised here together with illustrative quotes from participants.
Acceptability of the program

All of the participants supported the idea of a distance-based physical activity program designed to provide tailored-advice to individual breast cancer survivors. The main benefits identified by women were being provided with instructions on how to perform specific exercises correctly (e.g. stretches), having access to more information and having someone monitor their physical activity.

I think that could be quite interesting. It’d be good to be told how to do those correctly, for instance like doing sit ups and um stretches that type of thing (50 years old, 4 years post treatment).

I think it sounds like a really good program. I reckon it’d help me to be more motivated and help with actually remembering to do stuff. Cause I usually go ohhh, I’ll do it tomorrow but if you’re actually monitoring it you’re more likely to actually do something (44 years old, 5 years post treatment).

I certainly know it’ll help me because besides my husband, I’m the only one really who is motivating me and it’ll be nice to see that somebody else is genuinely interested in how I’m progressing or what I’m doing (55 years old, 3 years post treatment).

Preference for delivery schedule and program length

Preferences for the number and frequency of tailored newsletters were mixed. A few participants indicated receiving material once a month would be adequate, whereas others felt like it would be more useful to receive feedback weekly or fortnightly.
Preference for delivery schedule was influenced by how active participants currently were, with participants who were less active requesting more support. A few participants acknowledged that the length of the assessment they would need to fill out to receive feedback would impact on their preference. There was a consensus amongst the participants that three months was an appropriate total program length.

*I think three months could be enough because after three months you should have got yourself into like a regular routine and you’re probably know what you’re doing by the three month mark, I would have thought. I think once a month is fine (50 years old, 4 years post treatment).*

*If it is just a quick five minute one than weekly would be fine but if it’s a sort of more ten, fifteen, twenty minute one probably more monthly (44 years old, 5 years post treatment).*

**Deciding on the program framework**

Drawing from the above information derived from the scientific literature, experts in the field, consumer representatives and the program constraints, we decided that the program framework would consist of three intervention contacts (computer tailored newsletters delivered via the mail) delivered over a 12 week period (6 weeks apart), and iteratively tailored based on ‘update cards’ (assessing PA and goal setting behaviour over the last month) sent to participants at 4 weeks and 8 weeks post-baseline. A detailed description of the program framework is published elsewhere [56].
**Designing the feedback modules (i.e., newsletters)**

This step involved mapping the theoretically-derived determinants (i.e., SCT constructs) to behaviour change techniques appropriate for use in a distance-based intervention [57, 58]. Where possible, behaviour change techniques that have known efficacy (in terms of positive increases in PA and mediation effects) were chosen [57, 59]. Findings from the qualitative research also informed this process. A description of the strategies used to address each SCT construct is provided in Table 5.3.

**Step 3: Developing a tailoring assessment questionnaire**

The tailoring assessment questionnaire was imbedded within the baseline survey. All SCT constructs were assessed using validated and reliable measures where available. Some measures were adapted to make them more appropriate for use in the breast cancer population. A description of each measure is presented in detail elsewhere [56].

Given the recommendation to conduct mediation analyses when evaluating theory-based interventions [17, 60] we strived to include measures that could be used for both tailoring and mediation analysis in the baseline and follow-up surveys. At times, this made the tailoring process more challenging (because the items were not purposely designed for tailoring) but was considered necessary to contain the length of the survey and therefore enhance completion. The demographic, social cognitive, health and behaviour variables measured in the baseline questionnaire were used to tailor messages in all three newsletters. Two update cards measuring physical activity and goal setting behaviour over the previous month were also utilised to provide iterative feedback in newsletters two and three.
Table 5.3: Correspondence between Social Cognitive Theory constructs and behaviour change techniques in the *Move More for Life* intervention

<table>
<thead>
<tr>
<th>Construct</th>
<th>Evidence-based intervention strategies</th>
<th>Move More for Life examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-efficacy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence in ability to engage in PA (task self-efficacy) and to overcome barriers to PA (barrier self-efficacy)</td>
<td>• Facilitate action planning [59] • Provide specific instructions [59] • Reinforce efforts or progress towards goal behaviour [59] • Provide feedback on participants past behaviour [57, 61] • Promote vicarious experience [61]</td>
<td>• Activity at the end of each newsletter prompting participants to be specific about what, when and who they will be active with each week • Graphs in each newsletter displaying PA relative to the guidelines and past behaviour • Testimonial illustrating success</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External factors that influence (either positively or negatively) the PA behaviour of an individual</td>
<td>• Help secure social support in ways meaningful to individuals (note: planning social support and social change has been associated with lowering self-efficacy [59]) • Teach behaviour change skills that help individuals cope with environmental barriers e.g. time management [59] • Provide individuals with PA resources and encourage links with the community [62]</td>
<td>• Written advice encouraging participants to think of 1 or 2 people in their immediate circle they could share their physical activity plan with (to increase encouragement and opportunities for practical help). • Provision of contact details for breast cancer specific PA groups • Encouragement to form a concrete plan</td>
</tr>
<tr>
<td><strong>Behavioural capability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of what PA to perform and possession of PA skills necessary to perform those activities</td>
<td>• Inform breast cancer survivors of PA guidelines [63] • Provide instructions on how to perform specific activities (e.g stretching) [59].</td>
<td>• Written feedback about whether or not participants are meeting the guidelines • A3 poster illustrating stretches and resistance-based exercises</td>
</tr>
<tr>
<td><strong>Expectations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected effects of PA behaviour</td>
<td>• Address misconceptions about the benefits of PA and promote outcomes</td>
<td>• Provide overview of scientific evidence for the benefits of physical activity</td>
</tr>
</tbody>
</table>
that have functional meaning for the individual (e.g. reducing fatigue, managing weight) [59].

- Facilitate social comparison [59]

### Self-control

Personal regulation of goal-directed PA behaviour, includes activities such as goal setting, self-monitoring, problem solving and self-reward.

- Promote self-regulation behaviours [64]
- Encourage participants to set PA challenges for themselves
- Encourage self-monitoring [57]

- A3 activity planner

### Observational learning

Learning from the experience of others, by watching the actions and outcomes of others PA behaviour.

- Provide opportunities for vicarious experience via credible role models [34]
- Expert advice sections from exercise physiologist and behavioural scientist
- Testimonial from breast cancer survivor

*PA = physical activity

### Step 4: Developing design templates

The design templates were developed in collaboration with a design firm (http://www.headjam.com.au/). We provided the design team with a draft of the newsletter layout [Appendix 4.1] based on a review of design features in previous interventions [17] and of current resources available to breast cancer survivors, such as the *Exercise for Health* guidebook [65] and the Breast Cancer Network Australia’s *Beacon* magazine (http://www.bcna.org.au/news/beacon-magazine). A simple layout was chosen for each newsletter to allow for easy navigation. Specifically, each newsletter consisted of four A4 (8.3 × 11.7 inches) pages and contained the following message blocks, respectively: a welcome message, targeted expert advice (non-tailored),
feedback on PA behaviour and sitting time, a persuasive message (content-matched based on one or more SCT constructs) and an action planning task. The order in which SCT constructs were targeted was based on our literature review findings (e.g. self-efficacy and social support consistently related to physical activity behaviour) and Bandura’s [25] conceptual model regarding paths of influence (whereby self-efficacy is a focal determinant because of its effects on health behaviour both directly and indirectly via its influence on the other constructs e.g., self-control, outcome expectations and perceived facilitators).

The design team then developed the Move More for Life Logo and style (graphics style, text style, borders etc.), modified the draft templates for the three tailored newsletters, developed layout designs for the update card and additional resources (i.e., activity planner, exemplar exercise poster) and sourced all newsletter graphics. A personalised look was achieved by using water colour textures and hand-painted graphics (Figure 5.1). A description of each newsletter, along with the variables used to tailor information in each message block is published elsewhere [56].

![Figure 5.1: Newsletters 1-3, exemplar exercise poster, update card and activity planner, respectively](image_url)
**Step 5: Writing tailored messages**

A message concept booklet was developed for each newsletter [Appendix 4.2; Appendix 4.3; Appendix 4.4], whereby the intended message location, communication objective, message parameters (e.g., type of tailored message, message length, tailoring variables) and all possible feedback variables were outlined in detail before the writing process began. Messages were then written by CS, with a subset reviewed by EJ. The message concept booklets, including the tailored messages were then reviewed by a professional copy-editor to assure appropriateness and quality of the messages (see Figure 5.2).

![Message concept booklet sample](image)

**Figure 5.2: Sample from message concept booklet 1**
**Step 6: Creating tailored algorithms**

This step involves linking the tailoring assessment items, responses and tailored messages using algorithms [Appendix 4.5]. Algorithms simplify the relation among these elements using three sets of variables, i.e., raw variables, intermediate variables, and feedback variables. They also help to identify all available response options from the tailoring assessment, establish priorities among these options, and indicate a default message in the event of a non-response [22]

*Raw variable table.* Raw variables represent participant responses from the assessment. The first step in creating the algorithms is generating a raw variable table, including the questions from the tailoring assessment and all possible responses (e.g., see Table 5.4).

**Table 5.4: Sample raw variable table from the Move More for Life study**

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Possible values</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_first.name</td>
<td>Participants first name</td>
<td>20 characters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td>R_PA1.AR.ST_Sess</td>
<td>Average number of sessions per week individual performed strenuous activity at baseline.</td>
<td>3 characters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td>R_PA1.AR.ST_Min</td>
<td>Average time of each session (in minutes) individual spent performing strenuous activity at baseline.</td>
<td>5 characters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td>R_PA1.AR.Mo_Sess</td>
<td>Average number of sessions per week individual performed moderate activity at baseline.</td>
<td>3 characters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td>R_PA1.AR.Mo_Min</td>
<td>Average time of each session (in minutes) individual spent performing moderate activity at baseline.</td>
<td>5 characters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty = not entered</td>
</tr>
</tbody>
</table>
**Intermediate variable table.** The next phase involves creating an intermediate variable table, which allows the creator to form new variables from the raw data. For example, Table 5.5 demonstrates how we created an intermediate variable that describes whether or not participants are meeting the physical activity guidelines using the raw variables listed in Table 5.3. We created several other intermediate variables from the raw data, including intermediate variables for age, BMI, and for several of the SCT measures (e.g., high/low self-efficacy, high/low social support).

**Table 5.5: Sample intermediate variable from the intermediate variable table used in Move More for Life**

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Formulas</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_PA1.AR.Guid_modvig</td>
<td>Whether or not participants are meeting the aerobic guidelines of 30 minutes a day over 5 sessions at baseline (accounting for additional benefit of vigorous activity): (1) Not meeting the guidelines</td>
<td>IF (R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess &lt; 5) AND (R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min ≤ 150 THEN 1</td>
</tr>
<tr>
<td></td>
<td>(2) Meeting the guidelines</td>
<td>ELSE IF R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess ≥ 5) AND (R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min ≥ 150 THEN 2</td>
</tr>
</tbody>
</table>

**Feedback variable table.** The final step involved the development of the feedback variables and related algorithms. In essence, the feedback variables, based on the raw and intermediate variables, define the specific conditions under which respondents receive particular messages. In the example within Table 5.6, the intermediate variable is combined with two raw variables (using logic statements) to indicate which physical activity message participants should receive based on particular responses to the tailoring assessment.
Table 5.6: Sample feedback variable from the feedback variable table used in

*Move More for Life*

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>F_Aerobic_performance1</td>
<td>IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = &lt; 3 AND R_PA.PD_AR_global =</td>
</tr>
<tr>
<td></td>
<td>1 THEN 1</td>
</tr>
<tr>
<td></td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = &lt; 3 AND</td>
</tr>
<tr>
<td></td>
<td>R_PA.PD_AR_global = 2 THEN 2</td>
</tr>
<tr>
<td></td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = &lt; 3 AND</td>
</tr>
<tr>
<td></td>
<td>R_PA.PD_AR_global = 3 THEN 3</td>
</tr>
<tr>
<td></td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND</td>
</tr>
<tr>
<td></td>
<td>R_PA.PD_AR_global = 1 THEN 4</td>
</tr>
<tr>
<td></td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND</td>
</tr>
<tr>
<td></td>
<td>Etc.</td>
</tr>
</tbody>
</table>

**Step 7: Automating the tailoring process**

The message concept booklets, design templates and variable tables were passed on to a computer programmer. The computer programmer built the tailoring program from scratch using Hyper Text Markup Language (HTML), Cascading Style Sheets (CSS) and the programming language JAVA. There were four stages to development:

1. **Style.** The design template was translated into a PDF by creating a print specific style sheet (CSS). A basic wireframe (i.e., a page schematic) was made and tested in three internet browsers after resetting all browser printing settings. The background and typography were then created and tested using copy from the design makeup. Firefox was selected as the best browser, as other tested browsers were unable to render multiple columns.

2. **User interface.** An online user interface, styled to match the baseline survey, was built using HTML to input data from the baseline survey and generate individual PDFs (i.e., tailored newsletters). Each field was assigned a tag.
3. **Scripts.** Scripts were built using JavaScript. Raw variables were matched to their corresponding tag and given a set of rules (if/else-if/else rules). When the variables match the rules the corresponding message block becomes ‘active’. This is achieved by changing the CSS display value from ‘none’ to the block value for the particular message.

4. **Output.** The final output, including all newsletters, was built into a HTML document. All scripts and messages options were included inline (i.e., not external).

**Development Costs**

The tailoring system took the programmer three months to develop (1 month testing) and cost AUD $14,000. Overall, the *Move More for Life* program took eight (full-time) months to develop (inclusive of steps 1 & 6) and cost AUD $21,580. Development was carried out primarily by one researcher (CS), with regular support and guidance provided by EJ and RP. A detailed list of costs per stage of development, not including salary costs of project staff, is provided in Table 5.7.
Table 5.7: Cost per development stage of the Move More for Life program

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost-time</th>
<th>Cost-$AUD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Qualitative research</td>
<td>2 months</td>
<td>$1,800</td>
</tr>
<tr>
<td>Steps 2-7 Newsletter design</td>
<td>2 month</td>
<td>$3,380</td>
</tr>
<tr>
<td>Copy-editing</td>
<td>1 month</td>
<td>$2,400</td>
</tr>
<tr>
<td>Computer programming</td>
<td>2 months</td>
<td>$14,000</td>
</tr>
<tr>
<td>Step 8 330 Newsletters</td>
<td>1 month</td>
<td>$1,381</td>
</tr>
<tr>
<td>250 Update cards</td>
<td>1 week</td>
<td>$221</td>
</tr>
<tr>
<td>380 Exercise example posters</td>
<td>1 week</td>
<td>$670</td>
</tr>
<tr>
<td>380 Activity planners</td>
<td>1 week</td>
<td>$670</td>
</tr>
<tr>
<td>3,000 Logo stickers</td>
<td>1 week</td>
<td>$500</td>
</tr>
<tr>
<td>Total</td>
<td>8 months</td>
<td>$21,022</td>
</tr>
</tbody>
</table>

Note: project team member’s time has not been costed.

Step 8: Implementing the program

NOTE: The Move More for Life tailored-print intervention was implemented as part of a 3-arm nationally-based randomised controlled trial (RCT) conducted amongst 330 breast cancer survivors. The aim of the RCT was to explore the efficacy of the Move More for Life intervention compared to other print-based approaches. Steps 8 and 9 of this manuscript focus specifically on the implementation and preliminary process evaluation of the Move More for Life tailored-print intervention (developed as part of this PhD). Manuscripts detailing the RCT study protocol and findings are presented in the next chapter.
Promoting the program and recruiting participants

The tailored-print intervention was administered to 109 post-treatment breast cancer survivors recruited from around Australia via community and setting based recruitment methods (e.g., dissemination of study materials by cancer-focused organisations and health professionals; promotion of the study at breast-cancer specific community events). The overall recruitment index (mean number of days to accrue and enrol each participant) was 0.5.

Generating the tailored newsletters

For newsletter 1, participants were mailed the tailoring assessment and asked to return it within the next 10 days. On average, completed surveys were returned after 19 days (SD = 6.2). Participant data were entered into the online interface promptly, with newsletters generated (in PDF format) following receipt of the survey (M = 3.17 days, SD = 2.5). However, average time taken to print, package and mail the newsletters from receipt of participant data was 25 days (SD = 4.9). This was due to the utilisation of a professional printing company that required all newsletters to be printed together, rather than individually once the PDFs were available. For newsletter two and three, if participant’s update cards were not returned within two weeks the newsletters were printed without iterative feedback. The majority of participants did return the update card within the specified timeframe for newsletter 1 (70%) and for newsletter 2 (60%). However, only 49% of participants returned both update cards and 15% of participants did not return an update card at all.
Step 9: Evaluating the program

Study Sample and participant flow

Participants were mailed a questionnaire assessing their opinions of the intervention materials one month after receiving the final newsletter. Of the 109 participants who received the tailored intervention, 92 (84%) responded with feedback. There was no difference between responders and non-responders on important socio-demographic characteristics (i.e., age, marital status, aerobic activity, resistance activity, BMI, time-since treatment). Baseline characteristics of the 92 completers are presented in Table 5.8.

Table 5.8: Participant characteristics (n=92)

<table>
<thead>
<tr>
<th>Demographics</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>34-74</td>
<td></td>
</tr>
<tr>
<td>Married, de facto</td>
<td>78</td>
<td>79.6</td>
</tr>
<tr>
<td>Completed University</td>
<td>47</td>
<td>46.8</td>
</tr>
<tr>
<td>Income &gt; $1000 per week*</td>
<td>37</td>
<td>37.7</td>
</tr>
<tr>
<td>Full-time employed</td>
<td>23</td>
<td>23.4</td>
</tr>
<tr>
<td>Born in Australia</td>
<td>74</td>
<td>75.5</td>
</tr>
<tr>
<td>Remote/regional location</td>
<td>50</td>
<td>51.0</td>
</tr>
<tr>
<td>Health status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>26.60</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>5.11</td>
<td></td>
</tr>
<tr>
<td>Months post (active) treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>40.91</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>39.01</td>
<td></td>
</tr>
<tr>
<td>Disease stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>3</td>
<td>3.06</td>
</tr>
<tr>
<td>1</td>
<td>21</td>
<td>21.43</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
<td>29.59</td>
</tr>
<tr>
<td>3</td>
<td>22</td>
<td>22.45</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2.04</td>
</tr>
<tr>
<td>unknown</td>
<td>21</td>
<td>21.43</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>91</td>
<td>92.86</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>70</td>
<td>71.4</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>67</td>
<td>68.4</td>
</tr>
<tr>
<td>Hormones</td>
<td>55</td>
<td>56.1</td>
</tr>
</tbody>
</table>

Physical activity status

<table>
<thead>
<tr>
<th>Physical activity status</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic exercise &gt; 150 min/wk + 5 more sessions</td>
<td>23</td>
<td>23.5</td>
</tr>
<tr>
<td>Resistance exercise &gt; 6 exercises per week</td>
<td>15</td>
<td>15.31</td>
</tr>
</tbody>
</table>
Participant ratings of the tailored-intervention

The process evaluation assessment contained multiple choice questions (example item: ‘did the materials catch your attention?’) requiring participants to rate their response on a Likert scale (e.g., ‘1 not at all’ – ‘5 very much’). The assessment also contained one open-ended question inviting participants to provide additional feedback. Overall, participants rated the intervention positively. The majority felt that the tailored materials caught their attention (74% responded ‘3 somewhat to 5 very much’; M = 3.6, SD = 0.88), were personally relevant to them (73% responded ‘3 somewhat to 5 very much’; M = 3.7, SD = 0.96), and were useful for helping them to change their behaviour (63.2% responded ‘3 somewhat to 5 very much’; M = 3.2, SD = 1.11). Given though that the intervention was designed to tailor information to individual characteristics it is of concern that one-quarter of the participants did not find the intervention personally relevant to them and one-third of participants did not find it useful for changing behaviour.

To gain a better understanding of why some participants did or did not rate the intervention highly we examined participant’s open-ended comments.

Responses to open-ended questions

Several participants commented on the design of the newsletters. The majority of this feedback was positive, with participants describing the materials as eye catching, easy to read and colourful.

‘It was a great way to get info. Eye catching colours and easy to read info’.

‘Excellent materials: visual, colourful, well designed’.

‘I like very much the charts for the stretching exercises & resistance exercises.

Shall keep them very handy’.
However, some participants found elements of the materials unwieldy in size and suggested alternative formats to improve usability.

‘I found the size unwieldy - didn't know where to put the charts. I would prefer an app’

‘Daily activity diary too big - better if it was purse-sized so you could carry it around and fill it in etc. Wallet sized cards with exercise plus health tips also would be good’.

Mixed feedback was provided about the content of the newsletters. Whilst some participants felt that the content was appropriate and has increased their awareness and helped them to understand their own limits, others felt that the information did not suitably acknowledge their personal limitations.

‘They made me realize how important exercise is to my wellbeing.

‘It was very useful in helping me realise what I could comfortably do plus what the type of activity was called’.

‘I felt some of the stretches plus exercises were not suitable for someone recovering from breast surgery with axillary clearance. The material introducing the exercises did not stress enough the importance of a gradual introduction to weights plus the drawings showed heavy weights which would be unnecessary or possibly damaging. More about a gradual build-up of weight plus repetition would be better’.
‘Personally I found the goal setting unrealistic. I could not fit any more physical activity into my week. I work almost full time, I have a 14 year old, a property, parents to look after, I have no more time left for more physical activity’.

Furthermore, to explore individual characteristics that may be related to how participants rated the intervention we conducted two ordinal logistical regression analyses; one examining the demographic, health characteristic and social-cognitive baseline variables associated with finding the intervention personally relevant, and a second examining the association between these predictors and finding the intervention useful. All variables were assessed using a self-report pen and paper survey. A detailed description of the measurement items and assessment protocol is provided elsewhere [56]. The results of the regression analyses are presented in Table 5.9.

**Table 5.9: Individual factors associated with how participants rated the intervention materials**

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Variable categories</th>
<th>Personal relevance</th>
<th>Useful for changing PA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>P value</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>MVPA (mins)</td>
<td>0.99 (0.99-1.00)</td>
<td>0.389</td>
<td>1.01 (1.00-1.01)</td>
</tr>
<tr>
<td>Resistance training score</td>
<td>1.11 (1.03-1.19)</td>
<td>0.006†</td>
<td>1.12 (1.01-1.24)</td>
</tr>
<tr>
<td>Sitting weekday (mins)</td>
<td>0.99 (0.99-0.99)</td>
<td>0.035*</td>
<td>0.99 (0.98-0.99)</td>
</tr>
<tr>
<td>Sitting weekend (mins)</td>
<td>0.99 (0.99-1.00)</td>
<td>0.439</td>
<td>0.99 (0.99-1.00)</td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.98 (0.84-1.12)</td>
<td>0.851</td>
<td>0.96 (0.81-1.14)</td>
</tr>
<tr>
<td>Marital status</td>
<td>Not married</td>
<td>7.08 (0.79-63.42)†</td>
<td>0.080</td>
</tr>
<tr>
<td>Live with children</td>
<td>Yes</td>
<td>0.46 (0.72-2.91)</td>
<td>0.410</td>
</tr>
<tr>
<td>Income</td>
<td>$1000+ per week</td>
<td>0.36 (0.06-2.06)</td>
<td>0.257</td>
</tr>
<tr>
<td>Employment</td>
<td>Not working</td>
<td>0.04 (0.01-0.33)</td>
<td>0.002†</td>
</tr>
<tr>
<td>Education</td>
<td>Secondary school</td>
<td>Certificate or diploma</td>
<td>University degree</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------</td>
<td>------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.26 (0.11-13.88) *</td>
<td>0.845</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.65 (0.07-5.44)</td>
<td>0.694</td>
</tr>
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</tbody>
</table>

**Psycho-social determinants**

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome expectation</td>
<td>1.03 (0.86-1.21)</td>
<td>0.767</td>
<td>1.02 (0.84-1.23)</td>
<td>0.828</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome expectancy</td>
<td>1.07 (0.81-1.41)</td>
<td>0.622</td>
<td>1.42 (1.02-1.97)</td>
<td>0.034*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task Self-efficacy</td>
<td>0.97 (0.79-1.18)</td>
<td>0.792</td>
<td>0.73 (0.56-0.96)</td>
<td>0.026*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barrier Self-efficacy</td>
<td>0.99 (0.92-1.07)</td>
<td>0.885</td>
<td>0.95 (0.88-1.03)</td>
<td>0.301</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family social support</td>
<td>1.02 (0.94-1.10)</td>
<td>0.600</td>
<td>0.92 (0.84-1.02)</td>
<td>0.129</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friend social support</td>
<td>1.01 (0.92-1.09)</td>
<td>0.858</td>
<td>1.03 (0.94-1.13)</td>
<td>0.446</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioural control</td>
<td>0.79 (0.65-0.97)</td>
<td>0.028*</td>
<td>0.79 (0.62-1.01)</td>
<td>0.058*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-regulation</td>
<td>1.07 (0.97-1.19)</td>
<td>0.153</td>
<td>1.04 (0.92-1.17)</td>
<td>0.475</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action planning</td>
<td>0.92 (0.72-1.17)</td>
<td>0.514</td>
<td>1.11 (0.84-1.47)</td>
<td>0.454</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observational learning</td>
<td>0.38 (0.15-0.94)</td>
<td>0.038*</td>
<td>0.59 (0.17-2.05)</td>
<td>0.410</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Health/Cancer history**

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>1.09 (0.89-1.34)</td>
<td>0.377</td>
<td>0.89 (0.70-1.14)</td>
<td>0.382</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of life (Fact-B)</td>
<td>0.99 (0.92-1.07)</td>
<td>0.968</td>
<td>1.06 (0.99-1.14)</td>
<td>0.069*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue (Facit)</td>
<td>1.07 (0.93-1.22)</td>
<td>0.308</td>
<td>1.05 (0.93-1.18)</td>
<td>0.410</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time since treatment</td>
<td>1.00 (0.98-1.03)</td>
<td>0.401</td>
<td>0.99 (0.96-1.01)</td>
<td>0.593</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>No</td>
<td>0.12 (0.02-0.72)</td>
<td>0.021*</td>
<td>0.47 (0.06-3.48)</td>
<td>0.463</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>No</td>
<td>1.93 (0.25-14.70) *</td>
<td>0.523</td>
<td>0.84 (0.84-8.22)</td>
<td>0.878</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hormone therapy</td>
<td>No</td>
<td>18.89 (2.94-121.11) *</td>
<td>0.002†</td>
<td>0.81 (0.14-4.64)</td>
<td>0.814</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = marginally significant; P* = < 0.05; P† ≤ 0.01; OR (CI) = wide confidence interval (interpret with caution)
Factors related to participants rating of the intervention

Individual characteristics associated with lower odds of rating the intervention as personally relevant were: higher self-reported sitting time, higher knowledge and skill for performing physical activity (behavioural control), higher opportunities for observing significant others engage in physical activity (observational learning), not working and having no history of radiotherapy. Factors associated with lower odds of finding the intervention useful were; higher levels of sitting time, higher knowledge and skills for performing physical activity, being unmarried and having higher confidence for performing physical activity (task self-efficacy; see Table 5.9).

Characteristics significantly associated with higher odds for rating the intervention personally relevant were having higher levels of resistance-training, having undergone hormone therapy and living in a major city; factors associated with higher odds of rating the intervention useful were: higher levels of resistance-training, higher levels of aerobic activity, more positive outcome expectancies and higher quality of life (see Table 5.9).

Theories of information processing, such as the elaboration likelihood model [66], are often cited as the theoretical rationale for tailoring [22]. Such models suggest that personally relevant information is more elaborately processed than generic information and hence more likely to persuade an individual to change behaviour [67] [66]. The above results suggest that there is some overlap between finding the intervention materials relevant and finding them useful. To explore this link further we ran an ordinal regression model and found that those who rated the intervention materials as personally relevant were 4.8 times more likely to rate the materials as useful for helping them to change their behaviour (OR: 4.8; CI: 3.3-7.12; P= 0.00) . Randomised controlled trial findings exploring immediate and mid-term behavioural
outcomes of the intervention as well as mediating mechanisms [56] are forthcoming [67] and will provide further insights into intervention efficacy and theoretical development.

### 5.4 Discussion

Computer-tailored interventions are complex to develop. They necessitate extensive background research, deciding on a program framework, developing questionnaires and a corresponding message library containing hundreds if not thousands of messages, and computer technology to link all the components and automate the process. We found that the tailoring guide developed by Kreuter et al [22] was a valuable resource for guiding this process and served as a useful program planning tool in terms of integrating theory and evidence-based best practice into intervention strategies. However, applying this framework was a time consuming process, mostly due to the lack of information available for selecting a behaviour change theory, the lack of synthesis regarding determinants of physical activity in the cancer literature and the limited and often non-descript reporting on how and why previously published interventions worked or did not work. Hence, this paper hopes to accelerate the development process of future interventions in this field, tailored or otherwise, by providing a detailed synthesis of the development process and by highlighting aspects of the intervention that could be improved. Lessons learned whilst implementing and evaluating the program are discussed below in combination with suggestions for future research.

*Lessons learned implementing the program*
Producing timely tailored feedback. Our ability to produce feedback within a two week timeframe of receiving individual data was compromised by our printing protocol, which involved collating the newsletter PDF files (per newsletter) into a single file and sending it to a commercial printer. This added an extra 5-10 day delay to the delivery of all participant newsletters and an even longer delay for those participants who returned their survey and/or update cards well before the newsletters could be sent to print. Hence, the amount of time taken to deliver feedback to each individual was non-uniform and depended on how quickly individuals returned data to the research team. Newsletters could have been sent to participants in a more timely manner, within just a few days (M = 3.17 days, SD = 2.5), if printing had been conducted in-house. This approach is recommended for future print-based computer-tailored interventions.

Print-based delivery was chosen for the current intervention due to the perception that this would be most appropriate for the target group (i.e., older to middle aged women). However, we found that the majority of our participants did have internet access (97%) and several used email as their primary mode of contact with the intervention team. Hence, we suggest this assumption be revisited by future intervention developers targeting this group [17]. Researchers should consider other distance-based delivery modes, such as the internet and/or mobile devices. The major advantage of these technologically-based delivery modes is that they provide instant feedback and drastically reduce the data management tasks of the research team, which can be cumbersome in print-based interventions.

Population-based data examining intervention preferences, internet access and internet self-efficacy would be helpful to intervention developers when choosing a delivery mode. Similarly studies examining the relative performance of print and technologically-delivered computer-tailored interventions using the RE-AIM framework
(Reach, Efficacy, Adoption, Implementation and Maintenance [16]) are recommended.
Despite the public health potential of technologically delivered programs (e.g., web-based), preliminary findings suggest that current strategies for promoting adoption and retention in these interventions are limited in efficacy compared to print-based approaches [68].

Producing feedback that is personally relevant and useful for assisting behaviour. We were able to successfully provide personally relevant and useful information to the majority of the sample. However, it does appear that messages may not have been well-matched to some participants, particularly those with high scores on some psycho-social factors (i.e., confidence, knowledge and skill observational learning) and among those with potentially fewer resources (i.e., unmarried, not working, living outside of a major city). By conducting these analyses we have been able to pinpoint some potential weaknesses within the message library and suggest that future evaluations of tailored interventions include similar analyses to help refine tailored messages. It would also be useful to develop a tailoring system that has the capacity to provide information on the heterogeneity of the tailored messages actually delivered. This would allow researchers to examine if the tailoring algorithms used to select individual messages were appropriately designed to address the heterogeneity of the target group.

Next steps for the Move More for Life Program

This article focuses on ‘how’ the Move More for Life intervention works and provides some preliminary process evaluation results describing ‘how much’ and for whom the intervention works. This work will be extended in future publications exploring: the efficacy of the intervention compared to another promising print
intervention (described in detail elsewhere [65]) and a standard recommendation control
group at short and medium term follow-ups; Social Cognitive Theory mediators of
intervention effects at long-term follow-up; and moderators of intervention effects at
both medium and long-term follow up. Further details regarding these analyses have
been published elsewhere [56]. Combined, these articles ensure that a critical evaluation
of the working mechanisms of the intervention is possible, and will hopefully guide
researchers in the replication or adaption and re-application of the specified techniques.

Author contributions

ELJ and CES conceived the study. All authors provided input into the study
design. CES was primarily responsible for intervention design, with significant input
from ELJ and RCP. CES, ELJ and RCP were responsible for drafting the manuscript.
All authors critically evaluated the article for content and approved the final version.

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University of Queensland for her assistance in developing the tailoring assessment
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References


17. Short, C., James, E., Plotnikoff, R., and Girgis, A., *Efficacy of tailored-print interventions to promote physical activity: A systematic review of randomised


34. Baranowski, T., Perry, C.L., and Parcel, G.S., How Individuals, Environments, and Health Behavior Interact., in Health Behavior and Health Education:


68. Peels, D.A., et al., *Differences in Reach and Attrition Between Web-Based and Print-Delivered Tailored Interventions Among Adults over 50 Years of Age: Clustered Randomized Trial.* Journal of Medical Internet Research, 2012. **14**(6).
Part Three

Intervention evaluation
Chapter 6


**Citation:** Short C, James E, Girgis, A., Mcelduff, P., Plotnikoff R. Move More for Life: the protocol for a randomised efficacy trial of a tailored-print physical activity intervention for post-treatment breast cancer survivors. *BMC Cancer, 2012*, 12: 172

[Appendix 5.1]
6.1 Abstract

*Background:* Due to early detection and advances in treatment, the number of women surviving breast cancer is increasing. Whilst there are many positive aspects of improved survival, breast cancer survival is associated with many long-term health and psychosocial sequelae. Engaging in regular physical activity post-diagnosis can reduce this burden. Despite this evidence, the majority of breast cancer survivors do not engage in regular physical activity. The challenge is to provide breast cancer survivors with appealing and effective physical activity support in a sustainable and cost-effective way. This article describes the protocol for the *Move More for Life* Study, which aims to assess the relative efficacy of two promising theory-based, print interventions designed to promote regular physical activity amongst breast cancer survivors.

*Method and design:* Breast cancer survivors will be recruited from across Australia. Participants will be randomised into one of three groups: (1) A tailored-print intervention group, (2) a targeted-print intervention group, or (3) a standard recommendation control group. Participants in the tailored-print intervention group will receive 3 tailored newsletters in the mail over a three month period. Participants in the targeted-print group will receive a previously developed physical activity guidebook designed specifically for breast cancer survivors immediately after baseline. Participants in the standard recommendation control will receive a brochure detailing the physical activity guidelines for Australian adults. All participants will be assessed at baseline, and at 4 and 10 months post-baseline. Intervention efficacy for changing the primary outcomes (minutes per week aerobic physical activity; sessions/exercises per week resistance physical activity) and secondary outcomes (steps per day, health-related quality life, compliance with physical activity guidelines, fatigue) will be assessed. Mediation and moderation analyses will also be conducted.

*Discussion:* Given the growing number of cancer survivors, distance-based
behaviour change programs addressing physical activity have the potential to make a significant public health impact. *Trial Registration:* Australian New Zealand Clinical Trials Registry (ANZCTR) identifier: ACTRN12611001061921
6.2 Introduction

Due to earlier detection and advances in treatment, more and more women are surviving breast cancer each year [1]. Whilst improved survival is duly welcomed, breast cancer survivors are faced with both short and long-term health and psychosocial sequelae [2], including fatigue, reductions in physical and cognitive functioning, reductions in bone health, lymphedema, weight gain and mood disturbances [3-6]. Compared to the general (non-cancer) population, breast cancer survivors are at an increased risk of co-morbid chronic conditions and death from both cancer and non-cancer causes [7]. As such, there is a growing need for effective cancer recovery services that can help to improve the quality of life of breast cancer survivors and negate the associated health burdens and risks [8].

One promising cancer recovery strategy is the promotion of regular physical activity [9, 10]. Evidence from health outcome trials suggests that regular physical activity can address both the psychological and physiological burdens presented after breast cancer diagnosis and treatment [11, 12]. Furthermore, observational research suggests that regular physical activity may also have an impact on survival, with breast cancer survivors who are active after treatment having a lower risk of cancer recurrence, co-morbidities and death from all causes compared to those who are less active, regardless of cancer stage [13-15]. In recognition of these benefits, detailed exercise prescription guidelines for cancer survivors have been published by professional bodies in both Australia and North America [9, 10, 16].

There is also new evidence that addressing the pattern of activity is important, with unique metabolic consequences associated with prolonged sedentary behaviour, regardless of total activity time [15, 17]. Despite this evidence, the majority of breast
cancer survivors are not sufficiently active for health [17, 18] and efforts to encourage regular physical activity and reductions in sitting time are not a routine part of the cancer treatment or rehabilitation process [19-22].

Whilst over 70 physical activity intervention studies have been conducted with cancer survivors, the majority have been atheoretical face-to-face programs conducted during the treatment phase [23-26]. Whilst these interventions have been efficacious in improving important outcomes for cancer survivors, there is a need for more sustainable, less resource intensive approaches that can support survivors beyond the initial treatment phase [27-29]. Such programs should be grounded in behaviour change theory, and address the unique determinants of physical activity adoption and maintenance in the post-treatment breast cancer population [30, 31].

The purpose of this study is to evaluate the relative efficacy of two promising distance-based approaches (targeted and tailored print interventions) for promoting physical activity among post-treatment breast cancer survivors compared to a standard recommendation control group. In targeted-print interventions, irrelevant information is reduced by providing individuals with materials targeted to a particular subgroup they belong to (e.g., breast cancer survivors) [32]. In tailored-print interventions, computer technology is utilised to provide individuals with personalised advice based on information specific to them (derived from individual assessment) [32]. Both approaches have been put forth as low-cost, evidence-based alternatives to resource intensive face-to-face programs [32, 33], but little information exists about the relative efficacy and the cost/benefit of these approaches in the physical activity domain.

Some theories of information processing, such as The Elaboration Liklihood Model [34], suggest that people are more likely to process information in a way that is
conducive to behaviour change, if it is personally relevant to them. Based on this model, we hypothesise that individuals randomised into either the targeted or tailored print groups will experience significantly greater improvements at each timepoint on all primary and secondary outcomes compared to the standard recommendation control group. Furthermore, given the greater level of personalisation of materials in the tailored-print condition, we expect participants in the tailored-print group to experience greater improvements across physical activity outcomes compared to participants in the targeted-print group. This hypothesis relies on the assumption that breast cancer survivors are a somewhat heterogenous group in terms of determinants (i.e., demographics, social-cognitive and ecological factors) of physical activity behaviour change.

6.3 Methods

Design

This study is a nationally-based, three-arm randomised controlled trial (RCT), testing the relative efficacy of two distance-based physical activity interventions (tailored and targeted print) compared to a standard recommendation control group. Participants will complete data collection at baseline, 4 months and 10 months. Ethics approval was obtained from the University of Newcastle Human Research Ethics Committee (H-2010-11-3) [Appendix 3.4]. The RE-AIM framework [35] will serve to guide the dissemination of this program in terms of adoption, implementation and maintenance. The conduct and reporting of this study will adhere to the Consolidating Standards of Reporting Clinical Trials (CONSORT) guidelines [36] and to the Reporting Standards for Studies of Tailored Interventions [37]. The study flow chart is presented in Figure 6.1 (note: recruitment for this study is complete).
**Participants**

**Selection criteria**

Female breast cancer survivors who are over the age of 18 and who have finished ‘active’ cancer treatment (defined as surgery, chemotherapy and/or radiotherapy), who can read and write in English were eligible to participate in the study. All potential participants were required to complete a physical activity readiness questionnaire (PAR-Q; [38]), to identify those requiring review from their doctor prior to study enrolment [Appendix 5.2].

**Recruitment**

Participants were recruited using convenience sampling methods from a range of sources across Australia. Specifically, this involved (1) asking organisations (e.g., The Breast Cancer Network Australia, The Cancer Council, YWCA Encore) and health professionals (e.g., breast care nurses) with direct contact with breast cancer survivors to disseminate information about the study on behalf of the research team [Appendix 5.3; Appendix 5.4]; (2) promoting the study at events potentially relevant to eligible participants (e.g. breast cancer forums); and (3) snowballing recruitment (inviting participants to pass on study information to potentially eligible friends and acquaintances).

**Randomisation**

The randomisation sequence will be generated by a statistician (PM) using SAS 9.2 statistical software. An equal number of participants will be randomised to each group (1:1:1) using a randomised block design, with a block size of six, to ensure the study groups are balanced [39, 40].

Participants, identified only by their ID number, will be randomised by an administrative staff member into groups upon receipt of their baseline survey. All
project team members will be blinded to this process and participant details will remain de-identified until participant allocation is completed. Participant blinding is not possible due to the difference in delivery schedule of the two interventions.

**Statistical power and sample size**

The study’s primary analysis will be the comparison of self-reported physical activity behaviour (i.e. minutes per week of aerobic exercise and sessions per week of resistance training) between the three groups, from baseline to the 4 month time-point. Assuming a small-moderate correlation (r = 0.4) between baseline and post-intervention, to detect a mean difference of 0.5 standard deviation between study groups (small-medium effect size) for the main dependent outcome (i.e., physical activity behaviour) at post-intervention [41] the required sample size is 100 participants per group, allowing for a 20% loss to follow-up (power = 0.80; alpha = 0.01). An alpha of 0.01 was used to adjust for multiple comparisons.

As a secondary consideration, we also ensured that this sample size would be adequate to detect a clinically significant change in step counts per day (2000 steps per day [42], standard deviation of 3500 [43]) and found that we would be adequately powered to detect meaningful changes in both self-report and objective physical activity outcomes.

**Outcomes**

A pen-and-paper questionnaire is completed at baseline [Appendix 5.5], 4 months post baseline (immediate post- tailored intervention follow-up) [Appendix 5.7], and 10 months post-baseline (7 month post tailored-intervention follow-up) [Appendix 5.8]. At each of these time-points, participants will be asked to wear a pedometer for seven days and complete a step count diary [Appendix 5.6].
**Primary outcome**

The primary outcome variables, minutes of physical activity (aerobic) per week and average number of sessions/exercises per week (resistance) will be assessed using an adapted version [44] of the validated Godin Leisure-Time Exercise Questionnaire (GLTEQ) [45]. The adapted version will incorporate a resistance training (RT) measure [44, 46] that asks participants to report the frequency (times per week) and duration (average times per session) of resistance training activities on average over the past month. The original measure has been found to be both reliable and valid [47].

**Secondary outcomes**

*Step counts.* Average daily step counts [48] will be estimated based on at least three days of pedometry, which is sufficient to reliably estimate pedometer-determined PA [49, 50]. Participants will be instructed to zero the pedometer and record their accumulated steps at the end of each day for seven days, using the step count diary provided. The step count diary will also be used to record instances where the pedometer was intentionally removed (e.g. swimming) or when the participant forget to wear the device. Where reported, step count equivalents for non-ambulatory activities (e.g. swimming, cycling) will be calculated and added to the step count total using the method outlined by Miller *et al* [51].

*Adherence to PA guidelines.* Physical activity type, frequency and duration measured by 8 items from the adapted version of the GLTEQ [44, 46] will be used to calculate whether or not participants are meeting the PA guidelines for cancer survivors [10].

*Sedentary behaviour.* Sedentary behaviour is measured using a validated five item scale asking about time spent sitting (hours and minutes) each day during the week and on the weekend in the following situations (a) while travelling to and from places;
(b) while at work; (c) while watching television; (d) while using a computer from home; and (e) in leisure time not including watching television (e.g. visiting friends, dining out) [52].

*Health related quality of life.* Quality of life is measured using version 4 of the internationally validated 37-item FACT-Breast measurement system (FACT-B) [53]. The FACT-B is multidimensional, consisting of subscales measuring cancer specific aspects of physical well-being, emotional well-being, social well-being, functional well-being, and 10-items measuring breast cancer specific concerns.

*Fatigue.* Fatigue is measured using the validated 13-item FACIT (Functional Assessment of Chronic Illness Therapy) Fatigue scale, which assesses self-reported tiredness, weakness and difficulty conducting usual activities [54].

*Social cognitive mediators of physical activity*

Hypothesized social cognitive mediators of physical activity behaviour are assessed using previously published, validated instruments where possible. Some items were adapted to make them more appropriate for use in this study. The adaptations were based on our own qualitative research and formative research in the field (e.g. [55]) and were tested for face validity using a small convenience sample (n = 5) of post-treatment breast cancer survivors. In each survey, the time referent used for the items is framed based on the timing of the proceeding follow-up survey (i.e. the baseline survey time referent is ‘the past/next four months’ and the four and ten month follow-up surveys time referent is ‘the past/next six months’).

*Outcome expectations.* Outcome expectations is measured using 5 general items from the validated exercise pros subscale [56] with 6-additional items developed for this study based on formative research among breast cancer survivors [55, 57], including our own qualitative research and information provided by experts in the field. The items in
the scale assess the extent that individuals agree or disagree (1 = strongly disagree to 5 = strongly agree) that participating in regular physical activity over the next 4 month would for them: reduce tension or manage stress; increase confidence about one’s health; help to sleep better; have a more positive outlook; help control weight; regain lost strength; prevent a cancer recurrence; be enjoyable; increase fatigue; increase joint pain or result in lymphoedema. An example item includes ‘Over the next four months, participating in regular PA will help me prevent a cancer recurrence’.

**Outcome expectancies.** Outcome expectancies will be assessed by asking participants to rate how important each of the outcome expectations are to them (e.g. ‘For me, reducing joint pain is’) on a 3-point scale (1 = unimportant; 2 = important; 3 = very important). This scale has been utilised and tested in prior research [44, 58].

**Self-efficacy.** Task self-efficacy will be assessed using 4-items developed [57] and evaluated [59] in previous studies with breast cancer survivors and 3 additional items developed for this study to assess task-self efficacy for resistance training activities. The items assess the participant’s level of confidence (1 = not at all confident to 5 = extremely confident) that over the next 4 months they can: walk for 20 minutes without stopping; jog for 10 minutes without stopping; climb 3 flights of stairs; exercise for 20 minutes at a level hard enough to cause an increase in heart rate; do 6 wall push ups in a row; do one small session of resistance training including 6 different exercises; and do yoga for 60 minutes (Example item: ‘Over the next four months, I can do 6 wall push ups in a row’).

**Barrier self-efficacy** will be assessed using 12-items based on previous scales used in chronic disease populations (7 items developed and tested by Rogers et al [59] among breast cancer survivors and 5 items developed and tested by Plotnikoff et al among diabetes patients [56, 60]) and one item (‘when I can’t notice any improvements
in my body’) developed for this study based on formative research. Participants will be asked to rate their confidence (1 = not at all confident to 5 = extremely confident) that they can participate in regular physical activity over the next four months when: they lack the discipline to exercise; exercise is not a priority; the weather is bad; feeling tired; lack time; do not enjoy exercising; do not have someone to encourage them to exercise; in a bad mood or feeling depressed; have to do it alone; can’t notice any improvements in fitness; can’t notice any improvements in body; feel stiff and sore; and feel ill.

**Behavioural capability.** Behavioural capability is measured using 6-items assessing specific components of physical activity knowledge and skill that were developed for this study. Participants will be asked to rate on a 5-point likert scale (1 = strongly disagree to 5 = strongly agree) how much they agree with each of the statements: I know how to warm up and cool down before/after an exercise session; I have a good idea of what type of physical activity to do to gain health benefits; I have a good idea of how hard I should engage in physical activity to gain health benefits; I have a good idea of how much physical activity I should do to gain health benefits; I have the skills I need to engage in aerobic physical activities; and I have the skills I need to engage in resistance-based physical activities.

**Environment.** Social support is assessed using the 15-item social support for exercise habits scale [61]. Participants are asked to rate how often during the past four months their friends and family (separately) supported them/discouraged them to exercise in a variety of ways. Response options range from 1 = none to 5 = very often. (Example item: ‘During the past four months, my friends gave me encouragement to stick with my exercise program’). The perceived built environment will be assessed using an adapted version of the 7-item IPAQ environmental module [62]. Participants
will be asked to rate how much they agree or disagree (1 = strongly disagree to 5 = strongly agree) with the following statements: ‘most of the houses in my neighbourhood are detached houses’; ‘many shops, stores, markets or other places to buy things I need are within easy walking distance of my home’; ‘my home is within a 10-15 minute walk to a bus or train station; there are footpaths on most of the streets in my neighbourhood; there are facilities to bicycle in or near my neighbourhood; my neighbourhood has several free or low cost recreation facilities; and the crime rate in my neighbourhood makes it unsafe to go on walks at night’.

**Self-control and performance.** *Self-regulation* will be assessed using a 12-item scale developed for use among older adults [63]. The items measure six subscales of self-regulation (self-monitoring, goal setting, eliciting social support, reinforcements, time management, relapse prevention) and can be combined to produce an overall score [63]. (Example item: ‘Over the past 4 months, how often did you rearrange your schedule to ensure you had time for physical activity.’ Response options range from 1 = never to 5 = very often).

*Action planning* will be assessed using 4-items developed by Rise *et al* [64] and adapted by Rhodes *et al* [65](to say ‘physical activity’ instead of ‘exercise’).

Participants will be asked to rate the following statements according to their plans over the next two weeks (1 = no plans to 5 = detailed plans): I have made plans concerning ‘when’ I am going to engage in regular physical activity; I have made plans concerning ‘where’ I am going to engage in regular physical activity; I have made plans concerning ‘what’ kind of regular physical activity I will engage in; I have made plans concerning ‘how’ I am going to get to a place to engage in regular physical activity.
**Socio-demographics**

The following socio-demographic data will be collected: date of birth, marital status, parental status, living arrangement, country of birth, education, employment, income, internet access, health insurance status and geographical location.

**Health status and cancer history**

At baseline and each follow-up time point (where applicable), participants are asked five questions about their health status (physical limitations, perceived weight, menopause status, co-morbidities) and nine questions about their cancer diagnosis (age at diagnosis, cancer stage, treatment type, and prognosis).

**Process evaluation**

Participant evaluation of the intervention materials will be measured using 15 multiple choice items and one open-ended question, included in the immediate post intervention follow-up questionnaire. The 15 multiple choice items were purpose-designed by the research team and are based on the Elaboration Likelihood Model (ELM) [34], which is often utilised to explain the effects of health communication interventions. (Example item: ‘how personally relevant was the health information you received?’ 1 = not at all relevant to 5 = very relevant). The open ended question provides participants with a chance to make comments about the intervention materials.

**Procedure**

Potential participants were asked to contact the project co-ordinator to express their interest in participating in the study. Potential participants were then provided with an information statement and a consent form and asked to return it to the project team within two weeks. Information was resent at two weeks if no response was received.

Participants will be asked to complete a pen-and-paper questionnaire, wear a pedometer for seven days and complete a pen-and-paper step count diary at baseline,
four and ten months from baseline (Figure 6.1). Participants will be instructed to return the pedometer with the written materials using a reply paid envelope as soon as possible after each assessment period is complete. Participants who do not return the baseline questionnaire, and step count diary and pedometer within two weeks will receive one reminder call from the project co-ordinator. Participants who do not return the assessment materials within three weeks after this reminder call will be excluded from the trial.

Upon receipt of the baseline questionnaire, an administrative assistant will allocate participants using the ID number written on the questionnaire into one of three groups using the randomly generated allocation sequence provided by the statistician. Participants will be sent intervention or standard recommendation materials within three weeks of allocation.

Participants in the tailored-print intervention group will be sent additional intervention materials at 6 weeks and 12 weeks post baseline and update cards (3-item update card), 4 weeks and 8 weeks post base-line and asked to return them to the research team using a reply paid envelope within 7 days. Participants in the standard recommendation group will receive one tailored newsletter and a PDF version of the targeted guidebook after completion of the 10 month follow-up survey (Figure 6.1).

**Interventions**

**Targeted-print intervention**

Participants randomised into this group will receive a copy of a theory-based exercise guidebook developed specifically for promoting physical activity among breast cancer survivors. This guidebook was developed for use and evaluated in a previous study [66] and has been described in detail elsewhere [67]. We made minor changes to the guidebook to adapt it to an Australian audience (e.g. substituting photos and text
relating to snow).

**Tailored-print intervention**

Participants randomised into this group will be mailed three Social Cognitive Theory-based [68, 69] computer-tailored newsletters over a 12 week period (6 weeks apart). Each newsletter will be four A4 pages in length and will provide advice and feedback unique to the individual that relates to key determinants of physical activity adoption and maintenance among breast cancer survivors (as stipulated by previous research in the field [57, 70-77] and Social Cognitive Theory [68, 78]). The advice participants receive will be tailored using information derived from individual assessments at baseline, and ‘update cards’ (assessing physical activity and goal setting behaviour over the last month) sent to participants (in this group only) at 4 weeks and 8 weeks post-baseline. In each case, participants will be mailed the tailored-newsletters within two weeks after the completed assessment is received (see Figure 6.1).
Figure 6.1: Study flow chart

Breast cancer survivors contact Project Co-ordinator

Potential Participants sent information

Participants consent (N = 347)

No response/decline to participate

Baseline returned

Excluded

SR- Control group

Intervention group 1(tailored)

Receive Newsletter

Receive and return update card

Receive Newsletter

Receive Newsletter

Receive and return update card

Receive Newsletter

SR- Control group: 4 month assessment

Intervention group 1(tailored): 4 month assessment

Intervention group 2(targeted): 4 month assessment

Intervention group 2(targeted)

Receive booklet

Potential Participants sent information

Participants consent (N = 347)

No response/decline to participate

Baseline returned

Excluded

SR- Control group

Intervention group 1(tailored)

Receive Newsletter

Receive and return update card

Receive Newsletter

Receive Newsletter

Receive and return update card

Receive Newsletter

SR- Control group: 4 month assessment

Intervention group 1(tailored): 4 month assessment

Intervention group 2(targeted): 4 month assessment
Newsletter 1 (N1) will include information on the Australian physical activity guidelines for cancer survivors (non-tailored), tailored feedback on physical activity behaviour (aerobic, resistance and sitting time) relative to the guidelines, information about the beneficial outcomes of physical activity, safety advice and an action planning activity. An activity planner and exercise illustrations (stretches and resistance training exercises) will also be included.

Newsletter 2 (N2) will include expert advice from a behaviour change expert (non-tailored), feedback on physical activity performance (aerobic, resistance and sitting time) relative to N1, a testimonial illustrating success, advice on eliciting social support and an action planning activity.

Newsletter 3 (N3) will include expert advice from an exercise physiologist (non-tailored), tailored feedback on physical activity performance (aerobic, resistance and sitting time) relative to N2 and N1, advice on restructuring the physical environment, information about available support services and an action planning activity. See Table 6.1 for a brief overview of how Social Cognitive Theory was operationalised to form these intervention strategies and what variables were used to tailor information.

The tailored-print intervention was developed specifically for this study by following the eight-step procedure outlined by Kreuter et al [79]. More information is available upon request to the corresponding author and will be available in a separate manuscript.
Table 6.1: Operationalisation of SCT constructs for the *Move More for Life* intervention

### Newsletter 1

<table>
<thead>
<tr>
<th>Strategy</th>
<th>SCT construct</th>
<th>Tailoring variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advice for meeting the PA guidelines for cancer survivors</td>
<td>Self-efficacy</td>
<td>PA status</td>
</tr>
<tr>
<td>Information about the beneficial outcomes of PA</td>
<td>Outcome expectations</td>
<td>Outcome expectancies (outcomes valued by individual)</td>
</tr>
<tr>
<td>Advice on exercising safely</td>
<td>Self-efficacy</td>
<td>Behavioural capability</td>
</tr>
<tr>
<td></td>
<td>Behavioural capability</td>
<td>Health status (inc Lymphedema, fatigue, co-morbidities, bone pain).</td>
</tr>
<tr>
<td>Action planning</td>
<td>Self-efficacy</td>
<td>PA status</td>
</tr>
<tr>
<td></td>
<td>Self-control and performance</td>
<td>PA preference</td>
</tr>
</tbody>
</table>

### Newsletter 2

<table>
<thead>
<tr>
<th>Strategy</th>
<th>SCT construct</th>
<th>Tailoring variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert advice – behaviour change expert</td>
<td>Self-control and performance</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Self-efficacy</td>
<td>n/a</td>
</tr>
<tr>
<td>Feedback on PA performance</td>
<td>Self-efficacy</td>
<td>PA status</td>
</tr>
<tr>
<td></td>
<td>Self-control and performance</td>
<td>PA progress since N1</td>
</tr>
<tr>
<td>Testimonial</td>
<td>Observational learning</td>
<td>Self efficacy</td>
</tr>
<tr>
<td></td>
<td>Outcome expectations</td>
<td>Height</td>
</tr>
<tr>
<td></td>
<td>Self efficacy</td>
<td>Weight</td>
</tr>
<tr>
<td>Advice on enhancing social support</td>
<td>Environment</td>
<td>Social support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PA preference</td>
</tr>
<tr>
<td>Action planning</td>
<td>Self-efficacy</td>
<td>Goal setting behaviour after N1</td>
</tr>
<tr>
<td></td>
<td>Self-control and performance</td>
<td>PA status</td>
</tr>
</tbody>
</table>

### Newsletter 3

<table>
<thead>
<tr>
<th>Strategy</th>
<th>SCT construct</th>
<th>Tailoring variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert advice – exercise physiologist</td>
<td>Self-efficacy</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Behavioural capability</td>
<td>PA status</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td>PA progress since N1 and N2</td>
</tr>
<tr>
<td>Feedback on PA performance</td>
<td>Self-efficacy</td>
<td>PA status</td>
</tr>
<tr>
<td></td>
<td>Self-control and performance</td>
<td>PA progress since N1 and N2</td>
</tr>
<tr>
<td>Tips on changing PA environment</td>
<td>Environment</td>
<td>Access to PA facilities</td>
</tr>
<tr>
<td></td>
<td>Self-control and performance</td>
<td>Work status</td>
</tr>
</tbody>
</table>
Standard recommendation control group

Participants randomised into this condition will receive the ‘An active way to better health’ brochure published by the Australian government, detailing the national physical activity guidelines for adults [80]. The guidelines stipulate that Australian adults should: (1) think of movement as an opportunity; (2) be active every day in as many ways as you can; (3) do 30 minutes of moderate intensity physical activity on most, preferably all days; and (4) if manageable, do vigorous activity for extra health benefit. A copy of the brochure can be downloaded free of charge from www.healthyactive.gov.au

Statistical Analysis

Analyses will be conducted according to the intention to treat principal, as outlined by White et al [81]. Namely, the primary analysis will be conducted using all observed data (i.e., a completers analysis) and sensitivity analyses (accounting for all randomised participants) will be conducted to explore the impact of missing data [81]. Differences between treatment groups in primary outcome measures (i.e. the two physical activity scores) 4 months after randomisation will be tested using Analysis of Covariance (ANCOVA). The outcome in the model will be the subjects physical activity score at 4 months and the predictors will be treatment group and baseline value of the physical activity score. In the analysis of each of the two physical activity
measures, if the p-value for the treatment group is less than 0.025 (adjusted to account for the two primary physical activity analyses) then post hoc tests of the 3 pair wise comparisons will be undertaken to determine which treatment groups are different. Socio-cognitive and QOL measures will also be analysed using ANCOVA models. The study’s primary analysis will be the comparison of physical activity behaviour between the three groups, from baseline to the 4 month time-point. Secondary analyses will examine the PA behaviour change between the study groups across the other study time-point (i.e., 10 months). A mediation analysis on the employed social-cognitive variables will also be conducted to explore the causal mechanism of any intervention effects. Planned subgroup analyses include age, physical activity status at baseline, time since treatment, BMI, built environment, and co-morbidity status.

6.4 Discussion

This study will test the relative efficacy of two theory-based physical activity behaviour change interventions. In doing so, this study will address a seminal research question in distance-based patient-centred care – is tailoring or targeting health education messages a more efficacious approach to health behaviour change in the physical activity domain? Furthermore, this study will be one of the first to promote a pattern of PA that addresses the metabolic consequences of unbroken sedentary behaviours and the advantages of completing both aerobic and resistance-training exercises. The limitations reported in previous research will be addressed by examining adherence after the intervention period and by utilising an objective measure of physical activity behaviour (i.e., pedometers). Finally, this study will add to the behaviour change literature by addressing the paucity of knowledge surrounding determinants of
physical activity behaviour change among cancer survivors and potential mediators of intervention effects.

**Author contributions**

ELJ and CES conceived the study. CES, AG and RCP obtained the funding. All authors provided input into the study design. CES was primarily responsible for intervention design and recruitment, with significant input from ELJ and RCP. CES, ELJ and RCP were responsible for drafting the manuscript. PM provided statistical guidance and support and drafted the statistical analyses section of the manuscript. All authors critically evaluated the article for content and approved the final version.

**Acknowledgements**

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References


Chapter 7

Main outcomes of the Move More for Life Trial: A randomised controlled trial of the effects of tailored and targeted-print materials on physical activity, step-counts, sitting-time, quality of life and fatigue among post-treatment breast cancer survivors

Citation: Short C, James E, Plotnikoff R, Girgis A. Main outcomes of the Move More for Life Trial: A randomised controlled trial of the effects of tailored and targeted-print materials on physical activity, sitting-time and quality of life among post-treatment breast cancer survivors. Submitted to Annals of Behavioral Medicine, April 2013 (under editorial review)
7.1 Abstract

Background. Participation in physical activity can improve the health outcomes of breast cancer survivors. In order to impact public health, broad-reaching interventions that promote physical activity in a cost-effective and sustainable way are needed.

Purpose. To evaluate the efficacy of two distance-based interventions for promoting physical activity (aerobic and resistance-based) among breast cancer survivors.

Methods. Female breast cancer survivors who were over the age of 18 and who had finished ‘active’ cancer treatment were eligible to participate. Participants (n = 330) were randomly assigned to receive one of the following mail-delivered interventions: three computer-tailored newsletters, a previously developed breast cancer-specific physical activity booklet, or a pamphlet detailing the public health recommendation for physical activity (standard recommendation control). Primary outcomes were self-reported moderate to vigorous aerobic physical activity (minutes/week) and participant’s self-reported resistance training scores (sessions*exercises per week) at 4 months post-baseline. Secondary outcomes were pedometer step counts, whether or not participants were meeting the physical activity guidelines, time spent in sedentary behaviour, fatigue and health-related quality of life. Results. The majority of participants were engaging in some moderate-vigorous aerobic activity at baseline (median = 150 minutes per week), and most were not undertaking any resistance-training (median = 0 sessions per week). There was a significant treatment effect of the tailored-print intervention on resistance-based physical activity behavior, with participants randomised to this group three times more likely to commence resistance-training and meet the resistance-training guidelines immediately after the intervention than participants allocated to the standard recommendation control group. There were no other significant intervention effects.

Conclusion. Computer-tailored newsletters may be an effective strategy for enhancing
resistance-based physical activity among breast cancer survivors. The null findings relating to other outcomes may be due to ceiling effects and/or the sensitivity of the measures used. These issues require further exploration.
7.2 Introduction

Breast cancer is the most commonly diagnosed cancer among women [1, 2]. Whilst the majority of women diagnosed with breast cancer survive for at least five years after their diagnosis (approximately 82-89% [3, 4]), survivors experience a survival deficit relative to the general population, due to the risk of recurrence and the increased risk of chronic health conditions [2]. Furthermore, survivorship is associated with significant and chronic levels of burden and disability [5-7]. Effective health promotion strategies that improve the quality of life and cancer outcomes of this population are needed [8].

One promising strategy is the promotion of regular physical activity (PA) [9, 10]. Evidence from dozens of health outcome trials has shown that PA can address both the psychological and physiological burdens presented after breast cancer and its treatment [11, 12] and may also have an impact on survival [13-16]. There is also new evidence suggesting that reducing sedentary behavior is important, with unique metabolic consequences associated with prolonged sedentary behavior, regardless of total activity time [15, 16]. Unfortunately, most breast cancer survivors do not receive any PA support relating to cancer recovery [17-20] and the majority are not sufficiently active for health and spend too much time in prolonged sedentary behavior [16, 21]. The challenge is to provide broad reaching PA support that can be delivered in a cost-effective and sustainable way.

Given the large and steadily growing population of breast cancer survivors [22] effective alternatives and adjuncts to traditional face-to-face intervention modalities are desperately needed [23]. Whilst traditional face-to-face intervention modalities are often
efficacious they can be limited in public health impact due to challenges associated with delivering them consistently to large segments of the population [24].

A recent review [23] exploring the efficacy of physical activity behaviour change interventions among breast cancer survivors put forth computer-tailored interventions as a promising public health approach to promoting physical activity. Computer-tailoring is a technique that combines health behaviour change theory, social marketing principles and computerised expert systems to produce personally relevant intervention material for each individual in the target population [25-26]. A second review [27] highlighted that computer-tailored print interventions might be most beneficial in a secondary/tertiary prevention setting, where members of the target group tend to be older and cite preference for print-based interventions. In computer-tailored print interventions, the computer-tailored information is delivered to participants using print media, typically in the form of newsletters, booklets or pamphlets [28]. This method of developing print-media has been shown to be much more effective than standard ‘one size fits all’ (generic-print) approaches, presumably because they account for individual differences within the target population [27]. However, the monetary and time costs associated with developing the computerised system necessary for this approach can be a barrier to implementation. As such, it has been recommended that targeted-print interventions, which are less costly to develop but still allow for some specificity of intervention materials, also be considered [27,28]. Targeted interventions provide information considered relevant to a particular target-group (e.g., breast cancer survivors) based on defining characteristics of that group. In theory, computer-tailored interventions should be more effective than targeted interventions, since the information received in these interventions should be more personally relevant than in targeted interventions (assuming some heterogeneity of the target group) and since people are
expected to process information in a way that is more conducive to behaviour change under this condition [29].

Here, we report main findings from the Move More for Life Trial [30]. The Move More for Life trial is a randomised controlled trial designed to determine the efficacy of these two print-based intervention approaches (i.e., computer-tailored print and targeted-print) relative to a standard recommendation control for promoting PA and reducing sedentary behavior among breast cancer survivors. The primary outcomes are changes in self-reported moderate/vigorous aerobic PA and sessions/exercises of resistance-based activity at the post-intervention follow-up (4 months post-baseline). Secondary outcomes are adherence to the PA guidelines, time spent in sedentary behavior, objective pedometer step counts, quality of life and fatigue. We hypothesised that participants randomised into either intervention group would report significantly greater improvements at the post-intervention follow-up across all study outcomes compared to participants randomised into a standard recommendation control group, and that participants in the tailored-print intervention group would report the greatest improvements.

7.3 Method

Study design

The Move More for Life study design and methods are described in detail elsewhere [30]. In brief, this trial is a nationally-based randomised, three-arm parallel behavior change trial, with a 3-month treatment phase and an 4 month and 7 month post-study follow-up (Figure 7.1). The conduct and reporting of this study adheres to the Consolidating Standards of Reporting Clinical Trials (CONSORT) guidelines [31] and to the Reporting Standards for Studies of Tailored Interventions [32]. The trial is
registered with the Australian New Zealand Clinical Trials Registry (identifier: ACTRN12611001061921).

Setting and participants

The study was conducted at the University (omitted) from February 2012 to September 2012. English proficient female breast cancer survivors who were over the age of 18 and who had finished ‘active’ cancer treatment (defined as surgery, chemotherapy and/or radiotherapy) were eligible to participate in the study, regardless of whether they were sufficiently active or not. The decision to include breast cancer survivors who were already active at baseline was based on the importance of physical activity maintenance and the dose-response relationship between physical activity and health benefits [10]. All potential participants were required to complete a PA readiness questionnaire [33], to screen participants and identify those requiring medical safety clearance prior to study enrolment. If participants answered yes to any of the screening items they were asked to seek approval from their doctor and acknowledged that they had done so on the consent form before signing. Community and setting based recruitment methods, including (1) dissemination of study materials by cancer-focused organisations (e.g. cancer councils, hospitals) and health professionals (e.g. breast care nurses) and (2) promotion of the study at breast-cancer specific community events were used to recruit participants from across Australia. The recruitment method was selected to reflect likely dissemination pathways in the future.

Random assignment

An equal number of participants were randomly assigned to one of the three groups using a computer generated block randomisation sequence, generated by a statistician using SAS 9.2 statistical software. The process of random assignment was implemented in a blinded fashion by an administrative assistant not involved in the
project and situated at an office physically removed from the project staff. All project team members were blinded to this process until participant allocation was complete. Participants were aware that the general study aim was to test two interventions for promoting physical activity and that they may be allocated to a control condition. Participants were not formally informed which study condition they were allocated to, however participants who received the standard recommendation (control intervention) may have deduced the assignment upon receipt of the materials.

**Interventions**

All intervention materials were posted to participants via the mail. In each intervention, a recommendation to engage in aerobic physical activity, of at least a moderate intensity, for 30 minutes or more, on most days of the week was provided. In the tailored-print and targeted interventions, participants were also encouraged to perform resistance-training exercises 1-3 times per week. In the tailored-intervention arm only, participants were encouraged to limit discretionary sitting time to 2 hours per day and break up non-discretionary sitting time every half an hour. Both the tailored and targeted interventions were developed based on theory and were designed specifically to promote PA among breast cancer survivors. An overview of the intervention delivery schedule for each intervention is provided in Table 7.1. A detailed description of the interventions is provided elsewhere (see related publications [30, 34]) and in brief below

Briefly, participants randomised into the *tailored-print intervention group* received three Social Cognitive Theory-based [35] computer-tailored A4 4-page newsletters over a 12 week period (6 weeks apart). Newsletters were iteratively tailored using information derived from individual assessments at baseline and ‘update cards’
sent to participants (in this group only) at 4 weeks and 8 weeks post-baseline. In short, the newsletters contained comparative and progress feedback on participants PA behavior (compared to guidelines for cancer survivors,[10] PA levels of breast cancer survivors reported in other studies [16], and progress since the last newsletter), content-matched advice for creating a supportive physical and social environment, overcoming negative outcome expectancies and increasing self-efficacy, and contextualised images based on weight and age. Participants also received an activity planner and exercise poster containing exemplar resistance-based exercises and stretches.

Targeted-print intervention [34]

Participants randomised into the Targeted-print intervention group received a copy of the 54 page (A5) Theory of Planned Behavior [36] based booklet ‘Exercise for Health: An exercise guide for breast cancer survivors’, which has been evaluated in a previous study [37]. We made minor changes to the guidebook to adapt it to an Australian audience (e.g. substituting photos and text relating to snow).

Standardised intervention (control) [38]

Participants assigned to the Standardised intervention (control) group received the brochure ‘An active way to better health’ describing the national PA guidelines for Australian adults [38]. A copy of the brochure can be downloaded free of charge from www.healthyactive.gov.au. We provided participants with a professionally printed version (double-sided folded A4 sheet).
### Table 7.1: Overview of intervention and assessment timeline

<table>
<thead>
<tr>
<th>Baseline: Sent pen and paper survey, step log and pedometer*</th>
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<td><strong>Intervention</strong></td>
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<td><strong>Week 16</strong></td>
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</table>

*For primary outcomes, participants are asked to report average participation in physical activity in a typical week over the past month (i.e., past month before baseline period; past-month before follow-up, weeks 13-16).
Measures

The main study outcomes were assessed via pen-and paper survey mailed to participants at baseline and at 4 months post baseline (post-intervention follow-up). Mid-long term intervention effects will also be assessed at 10 months post-baseline and will be published in a separate manuscript. A description of the study outcome measures is provided briefly below and in detail elsewhere [30].

Primary outcome

The primary outcome, self-reported PA (aerobic and resistance-based) at 4 months post baseline was assessed using an adapted version [32-34] of the leisure score index (LSI) of the validated Godin Leisure-Time Exercise Questionnaire (GLTEQ) [39, 40]. The adapted version of the LSI contains three items assessing participants average participation (frequency and duration) in mild, moderate and strenuous aerobic physical activity in a typical week over the past month and a resistance training item that asks participants to report the frequency (times per week) and duration (average exercises and repetitions per session) of resistance training activities (i.e., lifting, pushing, pulling, and/or controlled lowering using machine weights, free weights, body weight or therabands) on average over the past month [39-41]. To obtain moderate-vigorous physical activity minutes per week, participants responses for the moderate and vigorous aerobic activity categories were added; vigorous activity time was weighted by multiplying it by two (to account for additional benefits). Mild activities were not included in the calculation. In order to ensure participants understood what the questions were asking a brief written explanation of aerobic and resistance-training activity (with examples) was provided before each question. The original measure has been found to be both reliable and valid [42].
Secondary outcomes

Adherence to meeting the PA guidelines for aerobic (150 minutes of aerobic activity over at least five days of the week) and resistance-based (1 session per week containing at least six exercises) activity [10] was calculated based on participants’ self-reported PA type, frequency and duration [39-41]. Objective PA behavior (mean daily steps) was assessed via at least three days of pedometry [44, 45] and a step count diary. Where reported, step count equivalents for non-ambulatory activities were calculated using the method outlined by Miller et al [46]. Self-reported sitting time was measured using a validated 5-item scale assessing sitting time across five different domains (i.e., while: travelling to and from places, at work, watching television, using a computer at home, in your leisure time, NOT including television) on a week day and on a weekend day [47].

Health related quality of life (HRQL) was measured using version 4 of the internationally validated 37-item FACT-Breast measurement system (FACT-B) [48]. The FACT-B is multidimensional, consisting of subscales measuring cancer specific aspects of physical well-being, emotional well-being, social well-being, functional well-being, and 10-items measuring breast cancer specific concerns. Fatigue was measured using the validated 13-item Functional Assessment of Chronic Illness Therapy (FACIT) Fatigue scale [49], which assesses self-reported tiredness, weakness and difficult conducting usual activities. For both of these scales, a higher score indicates better quality of life.

Social-demographics (e.g. date of birth, marital status, education, income, internet access, geographical location), health status (co-morbidities, menopause status, physical limitations, BMI), and cancer history variables (age at diagnosis, cancer stage, treatment type, and prognosis) were also assessed at these time points.
**Adverse events**

Participants were asked to report (using a 5-point Likert-type scale ranging from 1 = not at all to 5 = very much) if they have experienced any of the following problems due to engaging in physical activity in the past month: muscle stiffness, exercise-related injury, trouble breathing, feeling dizzy after exercising, severe chest pains during exercise or some other problem. If ‘some other problem’ was reported, participants were asked to provide a description of the issue.

**Sample size calculation and statistical analysis [30]**

To detect a mean difference of 0.5 standard deviations between study groups on our primary outcomes (i.e., self-reported aerobic and resistance PA) at the post-intervention follow-up with a power of 0.80 and a two-tailed alpha of 0.01 (controlling for two primary outcomes), we required a sample size of 100 participants per-group; assuming a small-moderate correlation (r = 0.4) between baseline and post-intervention and at least 80% retention at follow-up.

Analyses were conducted according to the intention to treat principle, as outlined by White et al [50]. Namely, the primary analysis was conducted using all observed data (i.e., a completers analysis) and sensitivity analyses (accounting for all randomised participants) using the baseline observations carried forward approach were conducted to explore the impact of missing data [50]. There were no differences among the two analytic approaches regarding the primary outcomes and the conclusions drawn from each analysis did not differ. Therefore, we present the results from the primary analysis only. Summary statistics (mean and SD) were tabulated to check for overdispersion of the two primary outcome variables and histograms were produced to check the distribution of the data. As overdispersion may have been present (due to the
means of the two dependent variables being smaller than the variance) and as the data were non-normally distributed (due to significant zero-inflation), zero-inflated negative binomial regression models simultaneously predicting ‘zero-physical activity’ and ‘physical activity’ were used to test for differences in treatment effects on the primary outcome variables (i.e., mins/week of aerobic exercise and sessions*exercises per week of resistance training) at 4 months post baseline. Only treatment group and baseline PA were included as predictors of PA score. Secondary outcomes were also analysed using binomial regression models (with a logit link). Scores on the FACIT-F scale were dichotomised to equal high or low fatigue using a clinically relevant cut-point (≤ 30 = high fatigue; > 30 = low fatigue) [51].

For all self-reported PA, values with reported standard deviations > 3.29 were truncated to 3.29 standard deviations from the mean to reduce the impact of outliers [52]. In the analysis of each of the two PA measures, if the p-value for the treatment group was less than 0.025 (adjusted to account for the two primary PA analyses) then treatment effects were considered significant.

7.4 Results

Flow of participants through the trial

Of the 349 breast cancer survivors who expressed interest in the trial, 330 provided informed consent and returned their baseline survey. Of the 330 randomised participants, 31% were recruited from a national breast cancer network (BCNA) review and survey group, 30% were recruited via existing email lists or via staff members of breast cancer-related organisations (e.g. Dragons Abreast, Brecan, YWCA Encore), 14% enrolled after receiving study information from a health professional (e.g. breast care nurse), and 5% were recruited via state-based cancer councils. The remaining
participants (20%) did not provide any information on how they were referred to the study or provided non-specific information only (‘enquired’, ‘brochure’). The overall recruitment index (mean number of days to accrue and randomly assign each participant) was 0.5. Figure 7.1 shows the consort diagram illustrating the flow of participants through the trial. Retention for this study was 90% (299 of 330) and did not differ significantly between groups ($P = .36$).
Participant consent  
N= 349

7 Withdrawn/Excluded  
3 health issues  
2 travel in study period  
1 unforeseen circumstance  
1 lack of time  
12 Baseline surveys not returned or not returned in time

Baseline received and randomised  
N= 330

Allocated to TP* group  
N = 109
Lost to follow up  
3 withdrawn  
1 poor health  
2 no reason given  
8 non responders

Post intervention follow-up returned  
N = 98

Allocated to TB* group  
N = 110
Lost to follow up  
3 withdrawn  
3 poor health  
1 deceased  
9 non responders

Post intervention follow-up returned  
N = 97

Allocated to SR* group  
N = 111
Lost to follow up  
7 non responders

Post intervention follow-up returned  
N = 104

*TP: tailored-print; TB: targeted-booklet; SR: standard recommendation control

Figure 7.1: Consort diagram: Participant flow chart
Sample characteristics

Baseline characteristics for all randomly assigned participants are reported in Table 7.2. Participants were generally middle-aged to older adults, married, born in Australia, post-menopausal and overweight. The majority of participants were engaging in some moderate-vigorous aerobic activity at baseline (median = 150 minutes per week), and most were not undertaking any resistance-training (median = 0 sessions per week). To examine the representativeness of our sample, we compared the characteristics of our sample with other Australian studies reporting representative population-based demographic and health status data for cancer survivors [53, 54]. We also compared participants’ HRQOL and fatigue scores with normative reference data for adult cancer patients [55]. Participants in our study were found to be representative of the breast cancer population in terms of age (54 ± 10), cancer stage (24% stage 1; 35% stage 2; 32% stage 3), treatments received (surgery, radiotherapy, chemotherapy, hormone therapy), and some aspects of PA behavior (i.e. low levels of participation in vigorous aerobic activity and resistance training) [54]. Participants also had comparable fatigue (16% of the sample were categorised as having high fatigue based on the clinically relevant cut-point ≤ 30 [51]), and HRQOL (general) scores compared to the general cancer population [55]. However, there was a higher proportion of participants in the current study not meeting the aerobic PA guidelines (70 % vs. 46% ; compared to a population –based sample of breast cancer survivors)[54]. Furthermore participants in the current study were generally more educated (44% vs. 21% completed university), more likely to be married (75.9% vs. 54.9%) and more likely to reside in rural/regional areas (53.1% vs. 38.1%) [53]. We also compared sample characteristics of participants who completed the trial (n = 299) versus non-completers (n = 31). There were no significant differences on demographic (age, marital status, education level,
employment, income, country of birth, location), medical (BMI, cancer stage, months since treatment, treatment received) or PA (aerobic and resistance-based) variables (all $p > 0.05$).

Table 7.2: Baseline demographic, health, and behavioural profile of participants by group assignment and overall

<table>
<thead>
<tr>
<th>Variable</th>
<th>Tailored</th>
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<th>Targeted</th>
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<th>Control</th>
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<th>Overall</th>
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<td>Age, years Mean</td>
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<td>Age, years Range</td>
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<tr>
<td>Married, de facto</td>
<td>86 78.9</td>
<td>83 75.5</td>
<td>81 72.9</td>
<td>250 75.8</td>
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<tr>
<td>Completed University</td>
<td>51 46.8</td>
<td>51 46.4</td>
<td>44 38.4</td>
<td>146 44.2</td>
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<tr>
<td>Income &gt; $1000 per week*</td>
<td>41 37.6</td>
<td>44 40.0</td>
<td>42 37.8</td>
<td>127 38.8</td>
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<td>Full-time employed</td>
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<td>66 20.0</td>
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<td>Born in Australia</td>
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<td>88 79.3</td>
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<td>59 53.6</td>
<td>60 54.1</td>
<td>175 53.1</td>
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<td><strong>Medical profile</strong></td>
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<td>BMI, kg/m² Mean</td>
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<td>BMI, kg/m² SD</td>
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<td>5.13 5.18</td>
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<td>Overweight**</td>
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<td>Obese**</td>
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<td>Postmenopausal</td>
<td>99 91 86 79 97 88 282 86.8</td>
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<td>SD</td>
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<td>Disease stage</td>
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<td>3 2.9 3 2.8 1 0.9 7 2.2</td>
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<td>27 26.5 22 20.8 25 23.4 74 23.5</td>
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</tr>
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<td>15</td>
<td>14.7</td>
<td>15</td>
<td>14.5</td>
<td>16</td>
<td>14.9</td>
<td>46</td>
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<tr>
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<td>102</td>
<td>93.6</td>
<td>99</td>
<td>90</td>
<td>105</td>
<td>94</td>
<td>306</td>
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<td></td>
<td>76</td>
<td>69.7</td>
<td>72</td>
<td>65.5</td>
<td>83</td>
<td>74.8</td>
<td>231</td>
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<tr>
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<td>75</td>
<td>68.8</td>
<td>75</td>
<td>68.2</td>
<td>75</td>
<td>67.6</td>
<td>225</td>
</tr>
<tr>
<td>Hormones</td>
<td></td>
<td>62</td>
<td>56.9</td>
<td>60</td>
<td>54.6</td>
<td>74</td>
<td>66.7</td>
<td>196</td>
</tr>
<tr>
<td>Current hormone therapy</td>
<td></td>
<td>55</td>
<td>50.4</td>
<td>58</td>
<td>52.7</td>
<td>65</td>
<td>58.5</td>
<td>178</td>
</tr>
</tbody>
</table>

**Fatigue (FACT-F)**

| Mean | 38.7 | 39.4 | 38.9 | 38.9 |
| SD   | 10.2 | 8.7  | 9.3  | 9.4  |

**QOL (FACT-B)**

| Mean | 103.9 | 105.8 | 105.7 | 105.2 |
| SD   | 17.7  | 16.9  | 17.7  | 17.4  |

**No. of co-morbidities**

| Mean | 1.8  | 1.4  | 1.4  | 1.5  |
| SD   | 1.7  | 1.5  | 1.3  | 1.5  |

**Behavioural profile**

| Aerobic exercise > 150 min/wk + 5 or more sessions? | 25 | 22.94 | 31 | 28.2 | 46 | 41.4 | 102 | 30.9 |
| Resistance exercise > 6 exercises per week | 16 | 14.68 | 20 | 18.18 | 21 | 18.92 | 57 | 17.27 |

**Steps/week (milner)**

| Mean | 9263.1 | 9023.5 | 9591.2 | 9292.6 |
| SD   | 4070.0  | 3677.5  | 3846.3  | 3863.2  |

**Sitting time weekday (mins)**

| Mean | 511.2 | 511.8 | 536.1 | 519.8 |
| SD   | 212.5 | 268.7 | 267.7 | 250.4 |

**Sitting time weekend day**

| Mean | 489.3 | 447.9 | 476.1 | 471.3 |
| SD   | 232.4 | 214.8 | 229.9 | 225.9 |

*n = 281 (49 participants indicated they prefer not to answer this item)

**Overweight defined as BMI >25 ; **Obese defined as BMI >= 30
**Adverse events**

There was no effect of treatment group on exercise-related adverse events at the post intervention follow-up \( (P > 0.05) \). Overall, there were relatively few serious issues reported, with fewer than 2% of participants reporting they experienced (‘not at all’ or ‘very much’) an exercise-related injury, or difficulty breathing and fewer than 1% reporting any chest pain during exercise. However, 10% of participants did identify several ‘other’ issues they were bothered by (‘quite a bit’ or ‘very much’), such as muscle stiffness, joint stiffness, bone/joint pain, fatigue, and pain at the operation site/scar tissue.

**Main Outcomes**

Raw outcome data before and after treatment are presented in Table 7.3. Results from regression models testing group differences on outcome variables are presented in Table 7.4.

**Self-reported physical activity**

*Aerobic activity.* At four months post-baseline, improvements in self-reported minutes of moderate to vigorous aerobic physical activity were in the direction expected (Table 7.3), with the odds of increasing physical activity greater in the tailored-print group compared to the other two groups (see Table 7.4). However, after adjusting for multiple comparisons the differences between groups was not significant at the 2.5% level of significance \( (p = 0.06) \). There were also no significant differences between groups for meeting the aerobic guidelines.

*Resistance-based activity.* There was a significant treatment effect for the tailored-intervention on self-reported resistance scores (sessions*exercises per week) at 4 months post baseline. Allocation to the tailored intervention significantly reduced the
odds of not doing any resistance-based physical activity ($p < 0.01$) relative to the control group and increased the odds of meeting the resistance-training guidelines by 3.38 at 4 months follow-up ($p < 0.01$). The treatment effect of the targeted-intervention group was not significant (see Table 7.4).

**Objective PA**

Similar to the trend seen with the self-reported data, mean step counts in the tailored and targeted groups increased moderately from baseline to follow-up, whereas step-counts in the control group decreased (Table 7.3). However there were no significant treatment effects at the 2.5% level of significance (Table 7.4).

**Changes in other secondary endpoints**

There were no significant treatment effects for minutes per day sitting (during a week day or during a weekend day), health related quality of life or fatigue (Table 7.4).
Table 7.3: Physical activity, sitting time, quality of life and fatigue before and after treatment

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Tailored (n = 98)</th>
<th>Targeted (n = 97)</th>
<th>SR (104)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>follow-up</td>
<td>Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>score</td>
</tr>
<tr>
<td>Primary outcomes</td>
<td></td>
<td></td>
<td>Baseline</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Change</td>
</tr>
<tr>
<td>MVPA mins/wk</td>
<td>177.8(196.3)</td>
<td>201.8(184.4)</td>
<td>+23.9</td>
</tr>
<tr>
<td>Resistance-training score</td>
<td>5.4(11.1)</td>
<td>13.5(27.0)</td>
<td>+8.2</td>
</tr>
<tr>
<td>Secondary outcomes</td>
<td></td>
<td></td>
<td>Baseline</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Change</td>
</tr>
<tr>
<td>% Meeting aerobic guideline</td>
<td>25</td>
<td>29</td>
<td>+4</td>
</tr>
<tr>
<td>% Meeting resistance-training guideline</td>
<td>16</td>
<td>35</td>
<td>+19</td>
</tr>
<tr>
<td>Step counts, per day</td>
<td>9263.1(4070)</td>
<td>9644.8(7745.6)</td>
<td>+381</td>
</tr>
<tr>
<td>Sitting weekday, mins/day</td>
<td>511.8(212.5)</td>
<td>467.5(211.1)</td>
<td>-44.3</td>
</tr>
<tr>
<td>Sitting weekend, Mins/day</td>
<td>489.3(232.4)</td>
<td>422.04(176.2)</td>
<td>-67.26</td>
</tr>
<tr>
<td>FACT-B</td>
<td>103.9(17.7)</td>
<td>106.2(18.0)</td>
<td>+2.3</td>
</tr>
<tr>
<td>Facit-F</td>
<td>38.7(10.2)</td>
<td>41.2(9.9)</td>
<td>+2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baseline</td>
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<td>Baseline</td>
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<td></td>
<td></td>
<td></td>
<td>Change</td>
</tr>
</tbody>
</table>
Table 7.4: Intervention effect on behavioural and health outcomes at 4 months post-baseline

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Coefficient (CI)</th>
<th>OR</th>
<th>Coefficient (CI)</th>
<th>OR</th>
<th>Coefficient (CI)</th>
<th>OR</th>
<th>Coefficient (CI)</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicting increase in behaviour / health</td>
<td>Predicting odds of no exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Tailored vs. SR</td>
<td>Targeted vs. SR</td>
<td>Tailored vs. SR</td>
<td>Targeted vs. SR</td>
<td></td>
<td></td>
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<tr>
<td><strong>Primary outcomes</strong></td>
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<td></td>
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</tr>
<tr>
<td>Moderate-Vigorous PA, mins/wk</td>
<td>0.20(-0.01;0.42)*</td>
<td>1.22</td>
<td>0.17(-0.04;0.38)</td>
<td>1.18</td>
<td>-0.46(-1.22;0.29)</td>
<td>1.58</td>
<td>-0.62(-1.41;0.16)</td>
<td>1.85</td>
</tr>
<tr>
<td>Resistance-training score, sess*exc</td>
<td>0.29(-0.10; 0.68)</td>
<td>1.33</td>
<td>0.23(-0.17; 0.64)</td>
<td>1.25</td>
<td>-1.11(-1.77;0.45)</td>
<td>3.03</td>
<td>-0.22(-0.91;0.46)</td>
<td>1.24</td>
</tr>
<tr>
<td><strong>Secondary outcomes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting aerobic guideline</td>
<td>0.36 (-0.32;1.03)</td>
<td>1.43</td>
<td>0.55 (-0.12;1.21)</td>
<td>1.73</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting resistance-training guideline</td>
<td><strong>1.22(0.47;1.96)</strong></td>
<td><strong>3.38</strong></td>
<td>0.65 (-0.10;1.4)</td>
<td>1.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step counts, per day</td>
<td>0.10 (-0.01;0.22)*</td>
<td>1.10</td>
<td>0.10(-0.01;0.22</td>
<td>1.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sitting weekday, mins/day</td>
<td>-0.02 (-0.15;0.11)</td>
<td>1.02</td>
<td>0.04(-0.09; 0.17)</td>
<td>1.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sitting weekend, Mins/day</td>
<td>-0.06(-0.23;0.07)</td>
<td>1.08</td>
<td>-0.03(-0.18;0.11)</td>
<td>1.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Related Quality of Life, FACT-B</td>
<td>0.36(-2.41;3.13)</td>
<td>1.43</td>
<td>-0.02 (-2.8; 2.7)</td>
<td>1.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue, Facit</td>
<td>0.21 (-0.67;1.10)</td>
<td>1.23</td>
<td>0.85(-0.08;1.79)</td>
<td>2.33</td>
<td></td>
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</tbody>
</table>

*p = 0.06; **p = < 0.01

7.5 Discussion

After the 12 week intervention period, there was a clear treatment effect of the tailored-print intervention on resistance-based PA behavior. Participants allocated to the tailored-print intervention group were 3.03 times more likely to commence resistance-training than participants allocated to the control group and were 3.38 time more likely to meet the resistance-training guidelines immediately after the intervention. This finding is likely to be clinically significant and of public health interest, given the
considerable health benefits associated with resistance-training in this group [10, 56, 57] and the characteristically low levels of participation in resistance-training at a population level [54]. Although in the direction hypothesised, the treatment effect of the tailored-print intervention on all other investigated outcomes was more modest.

To our knowledge there is only one other study that has tested the efficacy of tailored-print materials for promoting PA among cancer survivors. The study, by Demark-Wahnefried et al [58], examined the effects of a 10-month diet and PA tailored-print intervention (Fresh Start) compared to an attention control among newly diagnosed breast and prostate cancer survivors. At 1 year follow-up (2 months post-intervention), the tailored-intervention was found to be effective at enhancing both diet and PA behaviors relative to the control. There are a number of factors that make comparisons between Demark-Wahnefried et al’s findings and the current findings difficult to interpret. Namely, the Move More for Life intervention was shorter in duration and lower in intensity, provided support exclusively though mailed print materials (Fresh Start participants were mailed a pedometer and Theraband to serve as behavioral cues)[59], was targeted solely at breast cancer survivors, and at survivors at any stage post-treatment, and was tested against a minimal intervention control group.

There have been five tailored-print interventions comparable to the Move More for Life intervention (i.e., multiple contact iteratively tailored intervention) that have been evaluated in other populations [60-64]. Of these, four were effective in enhancing aerobic activity compared to the comparison condition at mid- to long-term follow-up (3-6 months post intervention). The null effect reported in the remaining study was likely due to the nature of the comparison conditions, with the tailored-print intervention compared to two other promising distance-based approaches (i.e., tailored-web and non-tailored web intervention) [61]. In the current study, ceiling effects offer a
plausible explanation as to why we did not observe significant improvements in aerobic activity where other similar studies did. All of the above studies excluded participants who were meeting the PA guidelines. In contrast, we included participants who were already active at baseline. The decision to include breast cancer survivors who were already active was based on the importance of maintenance of activity and the dose-response relationship between PA and health benefits [10]. Our results suggest that the tailored intervention may have had a maintenance effect, since aerobic activity and step counts in this group increased (even though follow-up was conducted during winter, when physical activity levels typically decline [65]), whereas self-reported activity and step-counts in the standard recommendation group decreased (both \( p =0.06 \)). However, this trend was not deemed significant after adjusting for multiple comparisons.

Vallance et al [37] examined the efficacy of a targeted-booklet intervention (adapted for use in this study) compared to a standard recommendation control group, pedometer intervention group and a combined intervention group (where participants received the pedometer and targeted-booklet materials) among a large sample of post-treatment breast cancer survivors. Participants in Vallance et al study included both inactive and active survivors. Results showed [37] that at 3 months follow-up, participants in each intervention group increased aerobic activity more than participants in the control group. However, the difference between the targeted-booklet group and the standard recommendation control group was not statistically significant. This same pattern was also seen in the current study. The most effective intervention in the Vallance et al study was the combined intervention, which had a significant intervention effect on aerobic PA and health-related quality of life. This, in combination with Demark-Wahnefried et al’s [58] findings, suggest that print-based interventions
focusing on aerobic activity may be more effective when provided together with a pedometer.

There is very little behavior change research to compare our resistance-training findings to. The majority of studies promoting resistance-training in breast cancer survivors are highly controlled health outcome studies [56]. In Vallence et al’s study, despite providing a standard recommendation to engage in resistance-training (i.e., engage in muscle strengthening activity twice a week) [37], the impact of this recommendation on resistance-training behavior was not assessed. In the current study, providing participants with the same recommendation (in the targeted-print group) did increase the odds of resistance-training compared to participants that were only provided with a recommendation to engage in aerobic exercise (control group), however this difference was not significant. It is unclear as to whether the tailored intervention was more effective at promoting resistance-training due to the tailoring of information itself or due to the amount of focus it received. Nonetheless, the findings do suggest that providing breast cancer survivors with print-materials containing detailed information about resistance-training can be effective for promoting home-based resistance-training. Further investigation is needed to determine if targeted print-materials could be equally effective if substantial resistance-training guidance was provided.

We found no significant intervention effects on sitting-time. This may be due to a lack of sensitivity of the measures used. We encouraged participants in the tailored-print intervention to break up their sitting time regularly by standing or engaging in light activity (e.g., walking to a colleague’s office instead of sending an email). It is likely that the self-report measure used would not be sensitive to this behavior. To gain
a better understanding of the intervention effects on aerobic activity and sedentary behavior further research using accelerometry is needed.

We also found no significant intervention effects on fatigue or quality of life. This could be due in part to a potential ceiling effect, given the relatively high level of quality of life reported by participants at baseline. Alternatively, this may be due to the short intervention period and/or a lack of change in aerobic physical activity. The high level of aerobic activity reported by participants at baseline does suggest that a ceiling effect is a more likely explanation.

The *Move More for Life* study has several strengths. It built on previous research by: examining the efficacy of two interventions shown to be promising at promoting PA in the breast cancer population but not previously tested under the same controlled conditions; and by exploring multiple aspects of PA behavior (inclusive of aerobic, resistance-training and sitting time). Other strengths include the evidence-based and theory-directed development of the tailored and targeted interventions; the randomised controlled trial design; the use of a previously evaluated comparison condition and a standard recommendation control condition; the inclusion of an objective PA measure; the large sample size; high retention rate; and sensitivity analyses. Some limitations of the study should also be acknowledged. We did not have an objective measure of resistance-training activity and the objective measure of aerobic activity captured step counts only and was self-reported. The use of unsealed pedometers may have also resulted in some bias. However, we did require participants to return pedometers at the end of each assessment period to ensure pedometer use did not bias the primary outcome (mins/week of self-reported aerobic activity on average over the past month). It is acknowledged that accelerometers, which capture objective data relating to both the
intensity and duration of physical activity (and sedentary behaviour), would have been a more valid and reliable measurement tool than those used in the current study. However, the use of accelerometers was not feasible due to the large number and geographical dispersion of participants and the cost associated with purchasing, mailing and insuring these devices in this context. Whilst our sample was fairly representative of the breast cancer population, we cannot be sure that the results from this study are generalizable to breast cancer survivors not represented in our study. This would include those with low baseline levels of aerobic physical activity. However, based on previous research it is likely that we would have seen bigger effect sizes among more sedentary individuals. Although including active survivors makes sense in terms of the importance of physical activity maintenance and the dose-response relationship between physical activity and health benefits, future studies should consider limiting inclusion criteria to those that are insufficiently active so that effect sizes more accurately portray the public health potential of the evaluated interventions.

Our data suggests that the delivery of print-based materials to breast cancer survivors is feasible and may be an effective way of promoting health enhancing patterns of PA. Further research exploring the effect of targeted-print materials on resistance-training behavior is needed. Whilst participants seem to like tailored intervention materials substantially more than any other print materials[66], developing tailored-print interventions may not be the best public health approach in terms of cost-effectiveness and sustainability if intensely delivered targeted interventions are shown to produce similar intervention effects. On that note, future research should examine the acceptability and efficacy of other delivery modes of tailored and targeted information that could further increase intervention reach and lower program delivery costs. Web-based approaches are a natural extension and may be appropriate in this population,
with 97% of Move More for Life participants reporting they have internet access at home.

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**Authors’ disclosures of potential conflicts of interest and author contributions**

None.
References


Chapter 8

General discussion
Each paper in this dissertation relates to the systematic and evidence-based development and/or evaluation of a computer-tailored intervention designed to promote physical activity among post-treatment breast cancer survivors. The three main aims of the thesis were to: (1) Synthesise the existing evidence-base relating to this topic, including factors related to intervention efficacy; (2) describe the systematic and evidence-based development of a tailored-print intervention designed to promote health-enhancing physical activity among post-treatment breast cancer survivors; and (3) evaluate the efficacy of the developed tailored-print intervention, compared to a targeted, and generic print intervention for enhancing physical activity behaviours in an adequately powered randomised controlled trial. The final section of this thesis will provide a summary of the main findings, followed by a discussion of the strengths and limitations of the included studies, the implications of the findings for practice, and recommendations for future research.

8.1 Main findings

8.1.1 Part I: Systematic reviews of the literature examining intervention efficacy

Paper 1 (Chapter 2) synthesised trials evaluating the efficacy of computer-tailored print interventions for promoting physical activity among adults. Seven of the twelve studies included in the review reported positive intervention effects on physical activity behaviour, ranging from 3 to 18 months post-intervention. The review concluded that tailored-print interventions can be effective in enhancing aerobic physical activity among adults, and that theoretically-based interventions, with multiple intervention contacts seem to be the most effective. As the majority of studies were conducted on middle-aged inactive females, generalisability of the findings may be limited to this group. Recommendations for future research included the need for trials
comparing the relative efficacy of tailored-interventions with other promising distance-based approaches (rather than no intervention controls), the inclusion of other relevant behaviour change objectives in such interventions (such as improving resistance-training and sedentary behaviours), and improving the generalisability of the findings by evaluating computer-tailored print interventions in other target populations.

Paper 2 (Chapter 3) synthesised trials exploring the efficacy of behaviour modification interventions for changing physical activity behaviour among post-treatment breast cancer survivors. Whilst very few trials were identified, significant intervention effects were reported for aerobic activity in eight out of the ten included trials. Maintenance of the intervention effect was assessed in four of these studies, two of which found sustained intervention effects in the mid-term and one found sustained intervention effects in the long-term. The ability to identify and evaluate factors relating to intervention efficacy was limited due to the relatively small number of studies conducted, the heterogeneity of the studies included, and the absence of effect sizes reported (in all but two studies). Nonetheless, an examination of the eight studies that did yield significant intervention effects suggests that 12 week interventions employing behaviour change techniques (e.g., self-monitoring, encouraging social support, goal-setting, providing instruction) derived from theory and delivered in a variety of settings (i.e., one-on-one, group, home) can be effective at changing the physical activity behaviour of breast cancer survivors, at least in the short-long-term. Key recommendations for future research include the need to develop and evaluate interventions that promote the adoption and maintenance of both aerobic and resistance-based activity, rather than focusing solely on aerobic behaviour, and the need to address methodological limitations, such as the lack of long-term follow-up, reliance on self-report measures and issues relating to selection bias.
8.1.2 Part II: Intervention development

Paper 3 (Chapter 4) [2] qualitatively examined the application of Social Cognitive Theory (SCT) to physical activity behaviours among eight post-treatment breast cancer survivors. The utility of SCT for guiding physical activity interventions among breast cancer survivors was confirmed. Although preliminary, the results of this study provided some new insights into the determinants of physical activity in this group that may have implication for practice. First, the study highlighted the need to address knowledge gaps relating to how much, and what kind of physical activities are needed to produce health gains. Second, the results indicated the need for sensitivity when promoting physical activity among this group; some survivors interpreted advice to exercise (provided by individuals within their social network) as pressure to ‘return to normal’. Therefore, care needs to be taken when giving advice not to reinforce guilty or negative feelings that may already exist and to acknowledge the breast cancer experience and associated barriers to exercise, especially when describing the benefits of physical activity and when providing feedback on current behaviour. Third, to encourage physical activity adoption and adherence, intervention strategies, locations and settings should be attractive, accessible and appealing and grounded by research evidence and sound behavioural theory.

Paper 4 (Chapter 5) described the theory-and evidence-based development and preliminary process evaluation of the Move More for Life program, a Social Cognitive Theory-based computer-tailored print intervention designed to promote physical activity among post-treatment breast cancer survivors. The intervention was developed and evaluated using the 9-step program-planning model outlined by Kreuter et al [3]. The developed program consists of the delivery of three computer-tailored newsletters over a 12 week period (6 weeks apart), and additional printed resources (activity planner and
exercise poster containing exemplar resistance-based exercises and stretches). Newsletters were designed to be iteratively tailored using information derived from individual assessments at baseline and ‘update cards’ sent to individuals 4 and 8 weeks after commencing the program. The newsletters contained comparative and progress feedback on individual’s physical activity behaviour, content-matched advice for creating a supportive physical and social environment, overcoming negative outcome expectancies and increasing self-efficacy, and contextualised images based on weight and age. The intervention was administered to 109 post-treatment breast cancer survivors recruited from around Australia. The ability to produce feedback within a two week timeframe of receiving individual data was compromised by the printing protocol, which involved collating the newsletter PDF files (per newsletter) into a single file and sending it to a commercial printer. This added an extra 5-10 day delay to the delivery of all participant newsletters and an even longer delay for those participants who returned their survey and/or update cards sometime before the newsletters could be sent to print. Despite this, the majority of participants rated the intervention positively. On a 5-point Likert-type scale (1 = not at all – 5 = very much), participants reported that the materials caught their attention (M = 3.6; SD = 0.88), were personally relevant to them (M = 3.7; SD = 0.96), and were useful for helping them to change their behaviour (M = 3.2; SD = 1.11). However, ordinal logistical regression analyses indicated that the intervention was not rated as highly among individuals with: higher levels of sitting time; higher knowledge and skills for performing physical activity; those who were unmarried; and those who had higher confidence for performing physical activity. By providing a detailed synthesis of the development and implementation process and highlighting aspects of the intervention that could be improved, the paper provides valuable information for the future development of computer-tailored interventions.
8.1.3 Part III: Intervention evaluation

Paper 6 (Chapter 7) reports results from a 3-arm RCT designed to test the efficacy of the *Move More for Life* tailored-print intervention and a targeted-booklet print intervention compared to a standard recommendation control condition. Participants were 330 breast cancer survivors recruited from across Australia. Retention was 90% and did not differ between groups. A significant intervention effect of the tailored-print intervention was found for resistance-based physical activity at four months post-baseline (immediately after the intervention). Participants allocated to the tailored-print intervention group were 3.03 times more likely to commence resistance-training (*p*<0.01) and were 3.38 times more likely to meet the resistance-training guidelines immediately after the intervention (*p*<0.01) than participants allocated to the control group. There were no other significant intervention effects of either intervention reported for any of the remaining study outcomes. A possible ceiling effect, due to the inclusion of already active breast cancer survivors at baseline, may have masked the magnitude of the intervention effect on aerobic activity. There was a positive trend for aerobic activity (measured by self-report and objective pedometer step-counts) for both intervention groups compared to the control group and results suggest there may have been a maintenance effect of these interventions (i.e., reducing decline in activity over winter months). It was unclear if the enhanced efficacy of the tailored-print intervention for promoting resistance-training was due to the tailoring of information, or the greater amount of resistance-training information provided in this condition. Future research exploring whether more intensly delivered targeted interventions could produce a similar intervention effect was recommended. Also recommended were studies examining the acceptability and efficacy of other delivery modes of tailored and targeted approaches, (such as online interventions), that could potentially increase
intervention reach and reduce implementation costs. Due to the ease of recruiting breast
cancer survivors into the trial and the high retention rate of participants it was clear that
there is considerable interest in obtaining health behaviour support among the target
group.

8.2 Strengths and limitations

The studies presented in this dissertation were conducted in a systematic manner
The use of program planning frameworks is associated with increases in intervention
efficacy [5] and increased likelihood that such interventions will work in the ‘real-
world’ [6]. Through this process, we conducted extensive background research using a
mixed-methods approach, consulted with consumer representatives and stakeholders
and received advice from a multi-disciplinary project team. This was invaluable for
informing the development of the interventions and the implementation of the
randomised controlled trial. The randomised controlled trial design employed in this
thesis is widely perceived as the gold standard design for evaluating intervention
efficacy [7]. Furthermore, our use of a non-wait list control is considered ‘best practice’
in behaviour change trials [8]. By comparing our newly developed intervention to a
standard recommendation control and a previously evaluated intervention in a three-arm
trial, we were able to gain a better sense of the true effect size of the intervention and
likely public health impact [8].

Despite our strong design and systematic planning process, there are some
important limitations to note that should be considered when interpreting the results and
conclusions presented in this dissertation. First, the external validity of the RCT
findings needs to be taken into account. Due to the mixed recruitment method, with
some methods relying on self-referral, we are unable to accurately determine the level of non-response among the target-group. Large numbers of non-responders can lead to selection-bias, which negatively influences the external validity and generalisability of the study findings [9, 10]. However, it should be noted that participant characteristics observed in the current study were fairly representative of those observed in population studies of breast cancer survivors [11, 12]. This is important to acknowledge, given the community and settings-based recruitment approach utilised in the trial mimic the likely dissemination pathway of lifestyle interventions among this group.

Second, physical activity behaviour was primarily measured using a self-administered (subjective) questionnaire. This is likely to have introduced some measurement error. Comparisons between self-reported physical activity and direct measures of physical activity (e.g., accelerometers and pedometers) have consistently indicated that individuals tend to over-report physical activity when self-reporting [13]. Despite this, self-report measures are often utilised over other more objective measures in intervention research due to the lower-cost and ease of data collection and interpretation. In the current study, we aimed to reduce measurement error by utilising a self-report measure with good reliability and validity [14, 15] and by supplementing physical activity data collection with pedometers. Pedometers are a valid and reliable objective measurement tool of ambulatory physical activity [16, 17] and are relatively affordable compared to other objective measures. However, as they are unable to capture non-ambulatory activities (including resistance-training) or activity intensity, self-report was relied upon as the primary outcome for this trial. Accelerometry, which provides in depth data on daily activity patterns would have been the ideal objective measure for use in this study [18]. However, due to the high-cost of the devices, this approach was not considered feasible. In future studies, we suggest researchers consider
using accelerometers in a subset of the sample. This would offset costs and increase confidence in the validity of physical activity measurement. However, it is acknowledged that the use of these monitors requires some specialised knowledge and ongoing attention to the calibration of the device [19].

Third, due to delays associated with the use of commercial printing facilities we were unable to deliver tailored feedback to intervention participants within the planned two week timeframe [20]. This delay in delivery time may have impacted on intervention efficacy [1]. Whilst we expect this may have reduced the impact of the intervention, it is difficult to draw a clear conclusion due to the lack of available information in previous studies. In our systematic review of the literature [1], four of the seven studies that reported positive intervention effects on primary outcomes did not report delivery timeframes of print materials. However, where delivery time-frames were reported, positive intervention effects were seen for studies delivering feedback more promptly than in the current study (ranging from immediate feedback to feedback delivered 2 weeks after the tailoring assessment)[1]. The impact of the time taken to deliver computer- tailored materials on intervention efficacy is an important area for future research, especially since the ability to provide instant feedback in IT-based computer tailored interventions is often cited as a major advantage of this approach [21]. Hence, it is hoped that the detailed reporting of such factors in this dissertation will help to advance our understanding of how implementation of tailored interventions impacts on intervention efficacy.

**8.3 Public health significance and implications for practice**

The series of studies presented in this dissertation focus on a significant public health issue. Breast cancer survivorship is associated with a significant level of burden
and disability and a survival deficit compared to the general population. There is strong evidence that the promotion of regular physical activity among breast cancer survivors can help to negate some of this risk and improve the quality of life and health outcomes of this group. On the basis of this evidence, the promotion of regular physical activity has been recommended as a key cancer recovery and rehabilitation strategy [22-24]. Despite this recommendation, the majority of Australian breast cancer survivors do not receive any physical activity advice or support from their treatment team and services promoting lifelong physical activity that meet the needs of this group are lacking [25, 26]. Rather, a piecemeal approach exists, where individual treatment centres and other stake holders (e.g., not for profit organisations) offer varying degrees of support. Ideally, physical activity should be incorporated into the cancer rehabilitation process to complement other strategies that are already in place, such as psycho-social interventions and physiotherapy, and be delivered in a way that offers support in a sustainable and equitable way. Findings presented in this thesis may assist both researchers and providers to identify and/or develop such approaches.

8.3.1 Value of behaviour change interventions for promoting physical activity in this population

Findings from the systematic review presented in Chapter 3 demonstrate that behaviour change interventions designed to promote physical activity among post-treatment breast cancer survivors are feasible, acceptable and can be effective. Furthermore, it does seem plausible that several of the interventions identified could be employed as population approaches to physical activity promotion, especially those that were low-cost and distance-based, such as those developed by Pinto et al [27] (i.e., telephone counseling and print materials), Hatchell et al [28] (i.e., email messages and e-counseling), and Vallance et al [29] (i.e., targeted-booklet and pedometer).
The evaluation of the Move More for Life intervention, presented in Chapters 5 and 7, and the systematic review of tailored-print interventions presented in Chapter 2, provide some evidence that computer-tailored approaches may be of particular value. Participants rated the intervention highly in terms of usefulness for helping them to change their behaviour, and those who received the Move More for Life intervention were three times more likely to engage in resistance-training than those who received a standard recommendation to exercise. Unlike, other low-cost population approaches, computer-tailored interventions have capacity to provide information, advice, and feedback that is relevant to the unique characteristics of the individual receiving the advice. In a tertiary prevention setting, where individuals are at greater risk and have unique health and safety needs, this could be of particular value. Especially in a country like Australia, where innovative and wide-reaching approaches are needed to meet the health service needs of cancer survivors located in regional and remote areas, where access to services are typically limited.

8.3.2 Feasibility of providing behaviour change support via computer-tailored-print materials to the breast cancer survivor population

Whilst disseminating the computer-tailored print materials to 109 geographically dispersed participants across Australia, including those in rural and remote areas was shown to be feasible, implementation of the intervention was challenging. To generate the tailored feedback, participants were required to send completed assessments back to the study team at three different time-points. Responses to the assessments then had to be entered into the tailoring software by the research team to generate a PDF version of each tailored newsletter. The research team was then required to compile the individual PDF files into a single file and send it off to a commercial printer. Once the printed
newsletters had been returned to the team, they required packaging and mailing to participants. For most service providers, this approach to generating and supplying tailored-newsletters would be burdensome, especially when delivering newsletters to thousands of individuals, rather than the relative small sample delivered newsletters in the *Move More for Life* study. That is not to say that tailored-print approaches should not be considered as a cancer control approach, but rather that some adaptation and additional resources may be required. In Australia, organisations that have existing support structures in place and considerable ‘man power’, such as the Cancer Council or The Breast Cancer Network Australia, could potentially disseminate this kind of intervention feasibly, especially if adequate in-house printing facilities were made available. This would ‘value-add’ to the current intervention services that are provided by these organisations.

Computer-tailored interventions delivered via interactive technology should also be considered by service providers. These interventions have the added advantage of participants inputting data into the software themselves, providing instantaneous feedback to participants, and importantly, an infinite number of people can utilise the service without placing additional burden on the service providers. Such interventions could be placed on websites of existing organisations, free of charge nationally and internationally.

In the past year, open source software platforms have been made available (e.g., https://www.lifeguideonline.org) that allow users to create and modify internet-delivered interventions. The *Move More for Life* intervention, or other similar interventions, could be easily transferred onto an online platform using this software. The disadvantage of this approach is that not everyone has access to the internet (although access is quite high and relatively equitable [30, 31]), and individuals with a
history of breast cancer are mostly mid-older aged adults, whom tend to have lower levels of internet self-efficacy [32]. However, given the pervasiveness of the internet in current society this may improve in the coming years. The major challenge is likely to be encouraging participant engagement and adherence to computer-tailored interventions delivered online. Previous studies examining the efficacy of online interventions (including those that are computer-tailored) have reported frequent problems recruiting, sustaining engagement and retaining participants [33, 34]. A recent study compared participant engagement and adherence among participants receiving either a computer-tailored online intervention or a computer-tailored print intervention [35]. The printed intervention resulted in a higher participation rate than the online-delivered intervention and dropout rates were significantly lower in the print-delivered intervention than the online-delivered intervention. The difference in the dropout rate was not explained by user characteristics [35]. A variety of explanations for this have been suggested, including competition on the internet for users attention from other websites, users increasing expectations of interactivity when online, and the novelty of receiving a personal letter, which are scarce in today’s society [1, 34].

Overall, both approaches allow assessment-based planning, have capacity for broad population-wide reach, and provide interactive learning experiences at a relatively low cost compared to face-to-face or telephone counseling. It does seem feasible that computer-tailored-print interventions could be employed as a cancer control strategy, especially if disseminated by organisations with existing support structures and providing that adaptations are made to the implementation process. It is also feasible that existing computer-tailored print interventions, such as The Move More for Life intervention could be transferred onto an online platform using freely accessible software, but it is likely that additional features will need to be added to sustain
engagement of the target group, and furthermore some internet coaching may be required. Offering the target group a choice as to whether they would like to receive print or online tailored-materials may be a viable solution, reducing the burden of delivery to staff and ensuring those without internet access or confidence can still obtain support.

The information synthesised in Chapters 2, 5 and 7 should be useful to those wishing to develop or evaluate computer-tailored interventions in the future, regardless of the target group and delivery mode. In particular, lessons may be derived from the development and evaluation of the the *Move More for Life* intervention, discussed in Chapters 5 and 7.

### 8.3.3 Facilitating the development of theory- and evidence-based physical activity behaviour change interventions targeted at post-treatment breast cancer survivors

Intervention development requires a thorough understanding of the problem, using theory and empirical evidence to specify determinants of behaviour and to propose a change process [36]. Chapters 4 and 5 of this dissertation provide qualitative and quantitative descriptions of the determinants of physical activity among breast cancer survivors, based on both theory and empirical evidence. These chapters, in combination with Chapter 6, also provide suggestions on how these determinants can be operationalised and addressed using behaviour change techniques with known efficacy. Information regarding the determinants of physical activity among breast cancer survivors has been lacking in the literature, and it is hoped that the findings and examples presented in these chapters will facilitate the development of further theory-based interventions targeting breast cancer survivors. However, it is acknowledged that several recent and relevant studies have been published since the preparation of these
manuscripts and an update of the literature review will be needed to fully inform future intervention development.

The findings presented in Chapter 4 also provide insight into the psychological impact of breast cancer and how this impacts on motivation for lifestyle change among breast cancer survivors. In particular, the findings challenge the popular notion that breast cancer survivors experience a ‘teachable moment’ due to their diagnosis, whereby they are motivated to ‘take control’ by adopting healthy lifestyles [37, 38]). Rather, the findings indicate that some survivors may ‘take control’ by choosing not to partake in physical activity, choosing instead to participate in activities they value more or obtain more enjoyment from. Hence, it is important that intervention providers be aware of the different impact breast cancer can have on an individual’s motivation for lifestyle changes and consider this heterogeneity when deciding how to frame health promotion messages, in terms of both content and tone. Well-framed health messages that are sensitive to, and acknowledge an individual’s thoughts, feelings and experiences are likely to promote engagement and more elaborate processing of the message than generic or ‘one size fits all’ messages [39].

8.3.4 Addressing multiple aspects of physical activity behaviour

Testing the efficacy of interventions that target multiple aspects of physical activity behaviour is important. If effective, such intervention could offer greater health benefits to survivors, and also maximise health promotion opportunities. The Move More for Life intervention is one of the only behavioural interventions targeted at breast cancer survivors that addresses multiple aspects of physical activity behaviour and is the first tailored-print intervention to do so. All but a few behaviour-change interventions (in the breast cancer domain) and all tailored-print interventions to date have targeted
either aerobic physical activity alone or aerobic physical activity in conjunction with another health behaviour (e.g., diet) [40, 41]. The Move More for Life study has shown that addressing multiple aspects of physical activity behaviour is feasible, and can lead to effective behaviour change. However, due to ceiling effects and poor specificity of the sitting time measure, it is unclear if interventions targeting multiple aspects of behaviour can lead to simultaneous behaviour change, or simultaneous pre-behavioural changes (e.g., increased knowledge, increased self-efficacy). To further inform practice, analyses exploring participant preferences for intervention content and delivery, together with mediation analyses examining the working mechanisms of the Move More for Life intervention will be conducted. These analyses are not presented as part of this dissertation but will be available in separate published papers.

8.3.5 Overview of significance and implications for practice

Participating in regular physical activity can improve health and quality of life outcomes among breast cancer survivors. The development of interventions and support services to facilitate adoption and maintenance of activity in this group are needed. Such interventions should be evidence-based and have sufficient reach, adoption and maintenance to have a public health impact. Findings presented in this thesis may assist both researchers and providers to identify and/or develop such approaches in the future.

In particular, this dissertation has contributed to the field by:

i. Providing a synthesis of the behaviour change literature in this field and highlighting promising distance-based intervention approaches.

ii. Describing the determinants of physical activity among breast cancer survivors and providing examples of how these can be addressed in an evidence- and theory-based intervention.
iii. Examining the relative efficacy of two promising distance-based approaches - a computer-tailored print intervention and a targeted-print intervention - for promoting physical activity in this population.

iv. Highlighting feasibility issues regarding the dissemination of computer-tailored print interventions, and exploring possible solutions and alternatives; and

v. Discussing directions for future research in the behavioural science domain.

Whilst the focus of this work has been on individual behaviour change it is recognised that for behavioural approaches to have a true public health impact they must be accompanied by environmental and policy approaches.

8.4 Future directions

8.4.1 Understanding the specific mechanisms that drive the effectiveness of computer-tailoring

At present, little is known about the specific mechanisms that drive the effectiveness of computer-tailored interventions. Meta-analyses have shown that some intervention components, such as the number of intervention contacts and the theoretical basis of the tailoring variables are associated with intervention efficacy [42, 43]. However, the ability to examine factors associated with efficacy has been significantly limited by the lack of scientific reporting and evaluation regarding ‘how’ computer-tailored interventions work.

Whilst there is a growing recognition that the application of theory to the development and evaluation of interventions is essential if we are to gain an understanding of how interventions work, applications to date have centred around
theories of behaviour change, and theories of information processing have been largely ignored. If we are to improve on previous interventions and enhance engagement and retention in computer-tailored interventions, a greater understanding of how information processing relates to behaviour change is needed. This will require the application and evaluation of new theories that focus on communication and information processing.

One information processing theory, the Elaboration Likelihood Model [39], has been considered by researchers in the field, and is often cited as the theoretical rationale as to why tailoring works [3]. The Elaboration Likelihood Model is based on the assumption that people want to have correct or reasonable attitudes and beliefs. The model describes two rather different processes by which a person can come to hold such attitudes or beliefs. The central processing route involves carefully thinking about and examining information pertinent to the merits of the topic. The second strategy, the peripheral route, involves less cognitive effort and occurs when a person relies on a relatively simple cue, such as whether the source appears to be an expert or whether the information is attractively packaged. The effortful elaboration that is required to take the central route involves paying careful attention to the relevant information in the message, and then relating that information to previous knowledge stored in memory and generating new implications of the information. Whereas, the peripheral route to persuasion recognises that it is neither adaptive nor possible to exert a considerable mental effort in thinking about all of the persuasive communication to which we are exposed (e.g., the 600 or so daily advertisements a typical adult is exposed to [44]) and hence at times must have some relatively simple means of deciding what is good and what is bad [39].

The theoretical rationale for tailoring is based on the proposed central processing route, whereby information that is tailored to be personally relevant to an individual
would be more likely to be elaborately processed, and in turn lead to attitudinal changes or other important pre-behavioural changes (such as self-assessment) that determine behaviour change [3]. Previous evaluations of computer-tailored interventions have provided some support of this, showing that computer-tailored intervention materials are more likely than generic intervention materials to be read, remembered, discussed with others, and perceived by the reader as interesting [3]. However, whether or not this translates into increased intervention efficacy has not been adequately examined. Furthermore, if this model is to be used as the theoretical rationale for tailoring, and hence used to help explain how tailoring works, the impact of the peripheral processing route should be operationalised and explored in future interventions.

In order to understand the mechanisms that drive the effectiveness of computer-tailored interventions (or in fact any behaviour change intervention), the application and evaluation (via mediation analyses and/or structured equation modelling) of both information processing and behaviour change theories is needed. Without such applications, we are unlikely to improve behaviour change techniques and are unlikely to further our understanding of how to engage participants and encourage elaborate processing of the information we provide. This will become increasingly important as we move from more traditional delivery methods to interactive IT-based delivery methods. Communication theories, such as the Diffusion of Innovations Theory [45] may prove particularly useful.

8.4.2 Exploring how to promote multiple behaviours and multiple aspects of behaviour

Breast cancer survivors are at increased risk of chronic illnesses such as cardiovascular disease and osteoporosis, death from non-cancer causes, cancer
recurrence, secondary cancers, as well as long-term and/or late effects of treatment, such as fatigue, depression, pain, reduced quality of life, and weight loss or gain [46-49]. These increased risks can be attributed in part to common lifestyle factors, such as physical inactivity (weight bearing and non-weight bearing), poor nutrition and prolonged sedentary behaviour [50, 51].

As individuals tend to be at increased risk due to more than one of these lifestyle behaviours, there has been a recent push to design interventions that focus on multiple lifestyle behaviours, rather than designing interventions that focus on a single lifestyle behaviour. The evaluation of interventions that can influence multiple health behaviours to reduce the burden of chronic disease and heath care costs seem to make good (economic) sense [52]. However, there is some concern among behavioural scientists that it is not possible to treat multiple behaviours simultaneously because it is too burdensome and places too many demands on a person’s inherent ability to change. For example, whilst an intervention focusing on physical activity and nutrition may lead to greater health benefits for cancer survivors if effective, in reality focusing on these behaviours together may prove burdensome, especially if multiple aspects of physical activity (e.g., resistance-training and aerobic activity) and nutrition (e.g., fruit and vegetable consumption, fat intake reduction) are targeted in the intervention, as would be recommended to maximize cancer outcomes [22, 53-55].

Whether or not interventions should focus on multiple aspects of a physical activity behaviour, or indeed multiple behaviours is still unclear in the behaviour change field at large [40]. Many questions on how such interventions are best delivered remain unanswered. Similarly, it is unclear whether such interventions are best to be implemented sequentially (one behaviour after another) or simultaneously (all at once)
Future research exploring these research questions is needed to optimise intervention outcomes and inform future public health practice.

8.4.3 Translating behaviour change interventions for breast cancer survivors into practice

To facilitate the translation of the discussed behaviour change interventions into practice, the ability of these interventions to be adopted, implemented and maintained at an individual and community level is required [55, 56]. The findings presented in this dissertation show that the majority of interventions targeting physical activity among breast cancer survivors are subject to selection bias, do not report maintenance outcomes of the intervention, rely primarily on self-report measures of physical activity and seldom report sustained intervention effects. Furthermore, it is clear that studies often report outcomes only at an individual level (e.g., physical activity outcomes) and not at a setting or organisational-level (e.g., adoption, implementation and maintenance of intervention by study staff and key stakeholders). The methodological weaknesses present in such studies, and the lack of information at both individual and settings levels hinders the validity of the interventions and must be addressed to progress the translation of research into practice.

A well-regarded framework for evaluating the validity and public health impact of health promotion interventions is the RE-AIM framework [57]. The framework consists of five dimensions (i.e., reach, efficacy, adoption, implementation, and maintenance) that occur at multiple levels (e.g., individuals, organization, and community) and interact to determine the public health impact of the intervention. The guiding premise is that failure to adequately evaluate programs on all five dimensions can lead to a waste of resources, discontinuities between stages of research, and failure
to improve public health [55-56]. If behavioural support for physical activity is to become a standard part of the rehabilitation and cancer recovery process, it is essential that future research focuses on the development and evaluation of behaviour change interventions based on the concepts presented in the RE-AIM framework.

**8.4.4 Promoting healthy behaviours in other at risk groups**

Lifestyle behaviours are modifiable risk factors for the development of several chronic diseases, and also for poor health outcomes among those who already have a chronic disease. Several at risk subgroups, such as the inactive, people with obesity or chronic disease (including people with cancer other than breast cancer), and people from underserved populations and ethnic minorities were not targeted in the computer-tailored intervention developed and evaluated as part of this dissertation. Whilst these sub-groups could be targeted within a single computer-tailored intervention, this was beyond the scope of this dissertation. Although it would be resource intensive to develop, and require expertise across a range of chronic diseases, the development of computer-tailored interventions that provide tailored information relevant to individuals within these subgroups would be a valuable public health tool for both primary and tertiary prevention. Future research should examine the efficacy of computer-tailored interventions targeted at these groups, and the feasibility and efficacy of computer-tailored interventions designed to promote improved health behaviours among multiple at-risk subgroups.
8.5 Conclusion

Health promotion approaches that address the health risk and burden associated with breast cancer survivorship are greatly needed. The promotion of regular physical activity is one such approach. The findings from this body of work provide insight into the types of behavioural approaches that may be most effective, and reinforce that such approaches should be theory-based and developed to have sufficient reach, adoption and maintenance in order to have a public health impact. It is hoped that the findings presented herein will accelerate the development of effective health promotion strategies directed at breast cancer survivors and other at-risk groups.
References


Move More for Life: The development and evaluation of a computer tailored-print intervention for promoting physical activity among post-treatment breast cancer survivors

Volume Two: Appendices

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Submitted for the Degree of Doctor of Philosophy

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Appendix 1

All documents in this Appendix relate to the manuscript presented in chapter 2 of volume 1:

‘Efficacy of tailored-print interventions to promote physical activity: a systematic review of randomised trials’
Appendix 1.1: Published Manuscript

Efficacy of tailored-print interventions to promote physical activity: a systematic review of randomised trials

Camille E Short1*, Erica L James2, Ronald C Plotnikoff3 and Afaf Girgis4

Abstract

Objective: Computer-tailored physical activity interventions are becoming increasingly popular. Recent reviews have comprehensively synthesised published research on computer-tailored interventions delivered via interactive technology (e.g. web-based programs) but there is a paucity of synthesis for interventions delivered via traditional print-based media in the physical activity domain (i.e. tailored-print interventions). The current study provides a systematic review of the tailored-print literature, to identify key factors relating to efficacy in tailored-print physical activity interventions.

Method: Computer-tailored print intervention studies published up until May 2010 were identified through a search of three databases: Medline, CINAHL, and Psycinfo; and by searching reference lists of relevant publications, hand searching journals and by reviewing publications lists of 11 key authors who have published in this field.

Results: The search identified 12 interventions with evaluations reported in 26 publications. Seven out of the 12 identified studies reported positive intervention effects on physical activity behaviour, ranging from one month to 24 months post-baseline and 3 months to 18 months post-intervention. The majority of studies reporting positive intervention effects were theory-based interventions with multiple intervention contacts.

Conclusion: There is preliminary evidence that tailored-print interventions are a promising approach to promoting physical activity in adult populations. Future research is needed to further identify key factors relating to efficacy and to determine if this approach is cost-effective and sustainable in the long-term.

Background

Participation in physical activity (PA) is well recognised as an important and modifiable determinant of both psychosocial and physiological health. To date, research on PA emphasises the health benefits associated with participating in regular moderate-vigorous aerobic activity and strength training over one’s lifetime [1-3]. There is also recent evidence to indicate that prolonged sedentary behaviour, such as sitting, may be an independent determinant of health, with prolonged sitting associated with ill health regardless of total leisure time activity [4-6].

Despite the known benefits of maintaining an active lifestyle, many people living in industrialised societies are considered to be insufficiently active to induce health benefits [7,8]. In 2000, physical inactivity was estimated to account for 1.9 million deaths worldwide and 19 million disability-adjusted life years [9]. As such, it is not surprising that physical inactivity has been labelled as one of the biggest public health problems in the 21st century [10]. A key challenge is to develop appealing and effective PA programs that can be provided in a cost-effective and sustainable manner. Several reviews have suggested that computer-tailored interventions, that utilise technology to provide individuals with customised health behaviour advice and feedback, offer a promising approach to physical activity promotion [11-20]. These interventions are distinct from (yet commonly confused with) generic and targeted interventions because they are aimed at individuals (within a defined population) rather than a population group (generic) or subgroup (targeted) [11]. Since the last decade, the
medium for computer-tailored interventions has become increasingly interactive. Due to advances in technology, there has been a move away from delivering tailored interventions via traditional print media (known as first generation interventions) towards delivering interventions via interactive technology, such as websites or mobile devices (known as second and third generation interventions, respectively [15,17]).

Second and third generation interventions have been put forth as more promising approaches due to the enhanced potential to provide real-time and interactive feedback to an infinite number of participants [13,21]. However, whether these benefits translate into enhanced efficacy is unclear. A recent systematic review [15] examining the efficacy of these latter generation interventions reported that 14 out of 17 included interventions were efficacious in changing PA behaviour, but only 7 of these were more efficacious than the control condition (all of which were wait-list control or minimal contact interventions). Where interventions were tested against other treatment options (such as non-tailored print materials and non-tailored internet sites), there were no significant between group differences. There have also been concerns about the external validity of these latter generation interventions, with studies reporting frequent problems recruiting, sustaining engagement and retaining participants [15]. As a result, more intensive web-based interventions have been recommended, such as utilising prompts through other mediums and ensuring websites are continuously updated and contain dynamic and interactive material [15]. Whilst these interventions undoubtedly do hold great public health promise it seems premature to outcast first-generation print-based interventions at this point.

First, there is no evidence that latter generation interventions are more efficacious than traditional print-based approaches. To date, only one study [22] has compared the relative efficacy of a first and second generation intervention in the PA domain and no significant differences in physical activity outcomes were found. Likewise, a recent meta-analysis [19] found no significant differences of the efficacy of computer-tailored interventions based on delivery channel and concluded that both print and web-based channels can be effective means of health communication.

Second, there are benefits and strengths of the tailored-print approach that should be considered: (1) Tailored-print approaches are likely to have a wider reach and acceptability in populations that are known to have low access and use of the internet, such as people living in rural or remote areas, individuals with lower socioeconomic status and older adults [23]. Of note, tailored-print strategies may play a special role in secondary/tertiary prevention, where the above characteristics (e.g., older age) exist in a large proportion of the target group (e.g., majority of cancer survivors are over 65 years of age and cite a preference for print-based interventions [24]) and where there are existing support structures in place that can provide the necessary man power to implement interventions (e.g. The Cancer Council); (2) In times where personal letters are scarce and emails are rife, people may perceive the real novelty lies in receiving a tailored letter. According to the Elaboration Likelihood Model [25], which is often given as the rationale for why tailoring works [11], this perception of novelty could lead to more elaborate processing of the tailored material. There is some evidence that this may be the case, with one study reporting participants had a greater recall of mailed print materials compared to an interactive website [26]. This may also explain why retention for tailored web-based programs is generally poor [15], with the novelty of tailored-websites potentially low compared to other competing sites such as Facebook; (3) If intervention developers are to consider individual preference for delivery mode, there are individuals who report preferring print-based interventions [27,28]. As there is good evidence that tailoring print materials enhances efficacy [11,18], it seems justified that intervention developers may provide tailored-print materials to individuals preferring print delivery modes. However, the same is not true for web-based interventions, with minimal evidence that tailoring websites further enhances efficacy in comparison to non-tailored websites [15,29].

Third, interventions may be more efficacious in changing PA behaviour if first and second generation interventions are combined to form mixed modal interventions. There is evidence that distance-based interventions are more likely to be effective if more than one delivery mode is used [30] and it has already been suggested that including prompts through other mediums may help improve retention rates for tailored-web-based interventions [15].

Hence, the relative ‘promise’ of the different approaches stems beyond the time taken to deliver feedback and is likely to be dependent on a number of factors, including the aim of the intervention and the population targeted. In light of this, intervention developers should base their decision on which delivery method or combination of delivery methods are most appropriate by using an intervention development framework, such as intervention mapping [31].

Whilst the evidence for second and third generation approaches in the PA domain has been recently reviewed in a well-conducted systematic review [15], the evidence on tailored-print approaches in the PA domain needs updating. The last comprehensive review was conducted considerable time ago [13] and did not focus on tailored-
print physical activity interventions specifically. Likewise, meta-analyses have been conducted but have included other health behaviours [16] and/or other tailoring approaches in the analysis [19]. Reviews that have focused specifically on tailored-print physical activity interventions have been narrative in nature and were conducted over a decade ago [18,32,33]. Whilst these reviews provide some insight into how efficacious tailored-print interventions are and some of the key strategies related to efficacy, none provide a comprehensive overview of the state of the evidence in the PA domain and none provide sufficient information to serve as a guide to those wishing to develop tailored-print interventions.

The primary purpose of this review is to evaluate the evidence for tailored-print interventions in changing PA behaviour, inclusive of aerobic, strength and prolonged sedentary behaviour. Given the known heterogeneity of tailored interventions, this systematic review (1) describes the available evidence and (2) the key factors relating to efficacy. This approach is recommended, rather than a meta-analysis, when there is significant heterogeneity of studies [34]. The secondary purpose of this review is to synthesise the literature in a way that will be valuable to intervention developers.

**Method**

**Search Strategy and Data Sources**

First, studies were identified through a structured electronic database search of all publication years (until May 2010) in Medline, CINAHL, and PsycInfo. The following search strings were used: (Physical activity* or exercise or motor activity or leisure activities or incidental activity or physical inactivity or sedentary behaviour*) AND (Tailor* or expert system or print or message) AND (education or behavio*). These strings were further limited to (18 years or older) and English language papers. Second, reference lists of relevant publications were scanned for studies not identified in the search process. Third, journals that published a large number of tailored health education articles were identified by sorting via journal name in endnote. All issues of six selected journals (Preventive Medicine, Annals of Behavioural Medicine, Health Education Research, International Journal of Behavioural Nutrition and Physical Activity, Patient Education and Counselling and Health Psychology) were searched electronically using Tailor* and physical activity* as key words. Finally, internet searches were conducted using the names of 11 key authors who have published in this domain.

**Study selection criteria**

Studies were eligible for inclusion in this review only if they examined at least one computer-tailored print intervention designed to promote PA and/or reduce sedentary behaviour in adults. Interventions were considered ‘computer-tailored’ if advice was generated for a specific person based on information derived from individual assessment using a computerised system [35]. An intervention was considered to be ‘tailored-print’ if it involved the delivery of tailored written materials.

Studies were excluded if they: 1) delivered the computer-tailored-print intervention in combination with non-print intervention strategies (eg tailored-print plus telephone counselling), hence the efficacy of the tailored-print component alone could not be isolated; b) did not include an appropriate comparison condition; or c) did not measure PA behaviour as a study outcome.

Initially, articles were assessed for eligibility by a single reviewer (CS) based on the study title. After this initial cull, study abstracts were assessed independently in an unblinded standardised manner by 2 reviewers. Findings were compared and disagreements between reviewers were resolved by consensus.

**Data extraction**

Previous published reviews [13,15,16,19] were used as a guide for reviewing selected studies and specific intervention characteristics identified as being associated with behaviour change in computer-tailored interventions were extracted. These characteristics included the (1) theory(s) and/or model(s) used to develop the intervention; (2) variables used to tailor messages; (3) format and content of the print materials; (4) frequency and duration of the tailored information being delivered; (5) number of behaviours targeted.

Key methodological characteristics of the identified studies were also extracted, including: the country where the study was conducted, size and source of the study population, eligibility criteria, study design, comparison group, the primary outcome measures and follow-up period. Follow-up periods were divided into three categories: short term (< 3 months), medium term (3-6 months), and long term (> 6 months). The methodological quality of each study was assessed independently by two reviewers using the McMaster quality assessment tool for quantitative studies developed by the Effective Public Health Practice, Canada [36]. Disagreements were resolved by consensus.

**Results**

**Study selection**

The initial search of the electronic databases yielded 2107 publications, which were reduced to 219 following review of the titles by one reviewer (CS). After removing duplicates and reviewing the abstract (by two independent reviewers), 25 articles met the inclusion criteria for this review and reference checking identified one
additional paper. The electronic search of specific journals and search of selected authors did not yield any new papers.

A total of 12 interventions [21,22,37-46] were reported in 26 publications [21,22,37-62]; with two [59,62] describing the long-term follow-up of interventions [40,46]; nine describing sub-analyses, including mediation analyses [50,51,54,58,61], moderator analyses [57] and cost effectiveness [52,55]; and three [47-49] describing the study design in additional detail (Figure 1).

The studies sourced were categorised by: 1) whether the tailored feedback was delivered in a single-contact (referred to as non-iterative) or via multiple contacts (referred to as iterative); and, 2) whether the studies focused on a single behaviour (PA only) or multiple behaviours (PA plus other; Figure 2).

Table 1 (additional file 1) provides a detailed summary of the characteristics of all of the reviewed studies.

**Study Characteristics**
Six of the identified studies tested single contact interventions and six tested multiple contact interventions (Figure 2). Of the multiple contact interventions, four [22,40-42] were related, testing an adapted version of the intervention (developed by Marcus et al 1998 [40]) and/or its trial in different settings. The majority of the multiple-contact interventions focused on the promotion of PA alone, whilst most of the single-contact

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**Figure 1 PRISMA flow diagram summarising selection process.**

Records identified through database searching (n = 2107)

Additional records identified through other sources (n = 1)

Records after title reviewed and duplicates removed (n = 219)

Records screened (n = 219)

Records excluded (n = 174)

Full-text articles assessed for eligibility (n = 44)

Articles included (n = 26)

12 interventions + 2 follow-ups

3 design

Full-text articles excluded (n = 18)

Review article: 1

Extra intervention component: 3

PA not outcome: 3
Interventions focused on the promotion of multiple health behaviours, including PA (Figure 2). The type of PA targeted ranged from aerobic exercise [39] to activities of daily living, including those performed at a light intensity [22,37,38,41,43,44,46]. The majority of studies focused on promoting participation in moderate-vigorous PA. No studies promoted strength training or reductions in unbroken sedentary behaviour (see Table 1, additional file 1).

The majority of the studies were conducted in North America [21,22,37,39-42] and the Netherlands [38,43-45] with one study conducted in Belgium [46]. Participants were recruited via advertisements, primary health care and health education organisations. The majority of studies recruited “at risk” individuals, including adults who were sedentary [22,37,40-43], overweight [21], patients [39] or older [45], with only three studies recruiting from the general population [38,44,46]. Study samples ranged from 194 to 2827 participants with the majority of participants being female, middle-aged and having completed at least a high school education. In studies that reported ethnicity [21,22,37,39-42], the majority of participants were reported as white.

**Intervention Characteristics**

**Comparison group**

Six studies [21,37,38,40,42,44] compared tailored print materials to other non-tailored print materials on the same topic (ie generic materials [21,37,38,40,44] or targeted materials [42]). Five studies [22,39,41,45,46] tested the relative effectiveness of different tailored interventions against a control group. Of these, three tested variations in tailored print interventions [39,45,46] and two compared tailored print interventions to tailored interventions delivered via another method (telephone [41] or internet [22]). Finally, one study [42] compared a single tailored-print group to a control group. Some studies matched the study conditions to varying degrees by controlling for formatting, theoretical underpinnings and the number of contacts (see Table 1, additional file 1).

**Theoretical Models, Tailoring variables and feedback type**

Most of the interventions were informed by The Trans-theoretical Model (TTM; [63]) in conjunction with at least one other behaviour change theory (see Table 1, additional file 1). In four studies [38,43-45], an integrated model (I-change model [64]) was used. In other cases, the use (joining) of multiple theories to inform the intervention was based on empirical evidence and expert opinion regarding the determinants of behaviour change. One study [37] relied upon a single theory (TTM) and another [21] made reference to several theory-relevant constructs, without referring to a specific theory.

All studies tailored materials based on psychosocial variables (e.g. perceived barriers), with some also tailoring on behavioural [21,22,38-46], demographic [21] and environmental variables [45]. The feedback type differed between single and multiple contact studies, with multiple contact studies able to provide progress feedback on psychosocial and behavioural variables (not possible in single-contact studies) as well as comparative and evaluative feedback (possible in single-contact studies) about how individuals’ health behaviours (e.g. PA, nutrition) compare to national recommendations and to the profiles of other successful individuals.

The majority of studies gave some detail about the content of the tailored materials, such as examples of the actual messages [40,42,43] or a description of the variables that were used to create each message [21,37,38,43-46]. However, most studies did not adequately describe the operationalisation of the tailoring variables (see Table 1, additional file 1). For example, only one study [45], which used an intervention...
mapping protocol [65], explicitly outlined the theoretical methods and practical strategies that were linked to the tailoring variables used to create each message.

**Delivery and format of print materials**
The majority of tailored print materials were delivered through the mail in either a standard letter or newsletter format [22,37-45]. Delay in delivery of mailed materials, relative to baseline measurement, ranged from 3 days [37] to 4 weeks [39] in the 8 studies reporting this variable. Two studies [21,46] delivered print materials onsite. In one of these studies [21], the materials were generated beforehand based on a telephone interview, but the gap between the interview and the onsite visit was not reported. In the second study [46], participants completed the baseline questionnaire on a computer kiosk onsite, and received the tailored feedback instantly on the screen and were given a print out of the information to take home.

**Measurement of Tailoring Variables**
The majority of studies reported some information regarding how many items were used to assess the tailoring variables and the number of response options per item (Table 1, additional file 1). Only three studies [22,40,41] provided psychometrics (ie reliability/validity information) for each item or set of items associated with the tailoring variables; and four [37,38,42,43] provided some psychometric information about their measures for at least one but not all of the variables. Variables relating to the TTM were well-described across studies; those relating to other theoretical frameworks were inconsistently reported.

**Measurement and Primary Outcome Variables**

**Physical Activity**
All studies assessed PA behaviour using subjective self-report measures. One study [41] used an objective measure to confirm the validity of the questionnaire (weak correlation) and two [22,41] used an objective measure as a secondary outcome (fitness measured by a graded submaximal exercise treadmill test). Of the self-report measures that were used, nine studies [22,38,40-46] reported that the measure was valid and reliable and three studies [21,37,39] used single-item questions with unknown reliability and validity.

Nine studies [21,22,37,38,40-42,45,46] used continuous primary outcome variables (ie minutes/week [22,38,40-42,46]; number of sessions per week/month [21,37,45]). Four of these studies [38,40,41,45] also calculated a dichotomous categorical primary outcome variable of whether or not participants were meeting a national health recommendation for PA. Three studies [39,43,44] used a categorical primary outcome variable only (yes/no meeting PA guidelines [43,44]; yes/no exercising > three times a week [39]).

Most studies based outcome assessment on multiple domains of PA (eg leisure, transport, occupation) performed at a moderate intensity or higher, except for one study [39] that only measured aerobic activity and one [46] that included light physical activities as a part of a total PA score (Table 1, additional file 1). Two studies did not specify the intensity of the PA measured [37,39] but specific categories of PA were provided.

**Follow-up periods**
Post-baseline and post-intervention follow-up measures are described in Table 1 (additional file 1). Follow-up periods for single-contact interventions ranged from short-term (1 month) to mid-term (6 months). Multiple contact studies had longer post-baseline follow-up periods ranging from mid-term (3 months) to long-term (12 months) but some of these studies did not include post-intervention measures [22,41]. Post-intervention measures in the multiple contact studies ranged from 3 months [38] to 6 months [59].

**Review of Methodological Quality**
Based on assessments by two reviewers using a standardised tool [36], only one [44] of the studies was rated as ‘strong’, eight [22,37,39-42,45,46] received a global rating of ‘moderate’ and three [21,38,43] received a global rating of ‘weak’. Inter-rater-reliability between the two reviewers was high and all discrepancies were resolved via consensus. Inadequate reporting of randomisation method, consent rates, assessor and participant blinding to study outcomes, and withdrawal differences between study groups were common methodological limitations across studies. All studies relied solely on subjective self-report measures of PA behaviour for the primary outcome. Marcus et al (2007a; [41]) used an objective measure (accelerometer) to confirm the validity of the self-report measure but the correlation coefficient was weak (.32). Marcus et al [48] also reported using an accelerometer to verify responses, but these data were not reported [22]. In three studies [21,37,39] the measures had not been validated and were not as comprehensive (single-item) as the measures used in the other studies (multiple items). Selection bias was a potential issue in nine studies [21,22,38,40-43,45,46] due to a low consent rate and/or the recruitment method (self-referral). Intervention integrity was compromised in the majority of studies [21,37,39,40-44-46,59] by failure to undertake (or report undertaking) intention to treat analyses. Of these studies, dropout rates ranged from 14% [39] to 39% [59] and one study did not report on participant withdrawal [21]. Only five studies [38,39,43-45] reported the magnitude of intervention effects (ie effect...
sizes). Table 1 (additional file 1) describes the methodological subcomponents that obtained a weak rating for each of the included studies.

**Intervention Effects on Physical Activity**

As no studies targeted reductions in unbroken sedentary time or participation in strength training, the following results relate to aerobic PA performed at a light-to-vigorous intensity.

Seven [38,40-42,44-46] studies reported significant short- to long-term positive intervention effects on PA, ranging from 1-24 months post-baseline and 3-18 months post-intervention. In one study [44], the positive effect was defined as a reduction in the decline of PA over the study period (3 months) compared to the control. Where calculated, intervention effect sizes were reported as small (Cohen’s d ranging from 0.12-0.35; Odds ratio’s ranging from 0.82-1.34; [38,39,43-45]) but fewer than half of the studies made this calculation. Five of the studies (out of the seven with positive results) included multiple post-baseline follow-ups [38,40-42,46]. Sustained intervention effects were found in all but one study [42]. In another study [40], sustained effects (at 12 months) were found for meeting PA guidelines but not for minutes/week of PA.

Of the five studies [21,22,37,39,43] that did not find significant positive intervention effects on PA: two [22,37] reported significant increases in PA in all study groups but no significant differences between groups at mid- and long-term; one study [38] found a positive intervention trend that was not significant at mid-term; one study [43] reported significant positive intervention effects at mid-term for motivated participants only; and one study [37] revealed significant increases in participants’ preferred type of PA at mid-term but no overall intervention effect on total PA. Only one study [21] reported a negative intervention effect (in a sub-analysis), where participants receiving generic materials that matched their individual characteristics (by chance) increased their PA more than participants receiving (deliberately) tailored print materials at short-term.

**Evaluation of Key Intervention Factors Impacting on Effectiveness**

**Number of contacts**

Multiple-contact studies appeared to be more effective in changing PA behaviour than single-contact studies. Only two [43,46] of the six single-contact studies reported the tailored-print interventions as superior to the control group. In contrast, five [38,40-42,45] out of the six multiple-contact studies reported superior intervention effects for the tailored-print condition. The remaining study [22] reported significant intervention effects, but did not find between-group differences between the tailored-print arm and two theory-based internet arms (one tailored and one non-tailored).

**Number of behaviours targeted**

Out of seven studies reporting positive intervention effects, four focused on PA behaviour only [40-42,45] and three targeted multiple health behaviours. This is potentially confounded by the greater number of multiple-contact studies focusing specifically on PA behaviour and the greater number of single-contact studies targeting multiple behaviours (Table 1, additional file 1).

**Comparison groups**

Comparison groups may have partially explained intervention effects. While there were no clear differences between minimal (e.g. generic materials) or no intervention control groups, of exception were the studies testing tailored-print materials against more rigorous interventions (targeted-print materials [42], tailored-telephone calls [41] or a tailored website [22]). Only one of these studies found a significant intervention effect in favour of the tailored-print materials [41]. It is worth noting that in this study, both interventions (tailored print and tailored-telephone calls) produced positive effects at mid-term but only the tailored-print condition produced sustainable effects at long-term. In the other studies comparing tailored print to more rigorous interventions, a marginally significant positive effect was found (compared to the targeted materials) at mid-term but not at long-term [42] and significant increases in PA were found across conditions (targeted-print and tailored-internet and standard internet) but no significant between group difference at mid or long-term were reported [22].

Of the three studies comparing the relative effectiveness of variations in tailored print interventions (varying on one factor) to a control group, significant intervention effects were attributed to differences between the intervention arms and the control group only. That is, intervention effectiveness was not enhanced nor reduced by the inclusion of environmental information [45], action plans [38] or by whether or not information on different behaviours was delivered simultaneously or sequentially [46]. Of note, a significant positive effect of including environmental information in the tailored-print materials [45] was reported in a subsequent paper due to differences in primary outcome variables (ie total weekly days of PA verses total weekly minutes of PA; [57]).

**Theoretical underpinning**

Interventions seemed to be most effective when underpinned at least in part, by either: Social Cognitive Theory, The Theory of Planned Behaviour or the I-Change Model. The use of the TTM alone [37] or the use of no theory [21] may be related to lower efficacy.
Delivery delay of print materials
Delivery time may have had an effect on intervention efficacy but it is difficult to draw a clear conclusion due to the lack of available information. Of the seven studies that reported positive intervention effects on primary outcomes, four did not report delivery timeframes of print materials (see table 1). Where delivery time-frames were reported, positive intervention effects were found for studies delivering feedback ranging from immediately up until 2 weeks post baseline.

Primary Outcome Variables
There were no clear differences in overall efficacy based on the use of continuous versus categorical dichotomous primary outcome variables. There was some indication that both types of outcome variables may be sensitive to detecting behaviour change at different time-points [40] but this was not the case in the majority of studies that included both types of outcomes [38,41,45].

Methodological quality
There were no marked differences in the overall methodological quality between studies reporting significant versus non-significant results. However, studies reporting a positive result were more likely to have used a valid and reliable PA performance measure (Table 1, additional file 1). Overall, the majority of studies reporting positive intervention effects were rated as ‘moderate’ in methodological quality [40,41,45,46], with one rated as ‘strong’ [44] and only one rated as ‘weak’ [38].

Mediators and Moderators of Intervention Effects
Six studies [21,41,43-46] tested for interaction effects in order to identify possible modifiers. Whilst several modifiers were identified, the direction of modification was inconsistent across studies. For example, where BMI was assessed, one study [46] reported an association between higher BMI and increased PA, two studies [21,45] reported an association between lower BMI and increased PA and one study [44] reported no association. Of importance, there was some indication that intervention effects were not moderated by PA levels at baseline.

Only four studies [21,40,41,45] conducted mediation analyses. Analyses were restricted to variables relating to the TTM and perceptions about the tailored materials. The results of these analyses were inconclusive and provide only minimal evidence that PA increases are mediated by changes in constructs from the TTM (i.e., self-efficacy, cognitive and behavioural processes, decisional balance).

Cost-Effectiveness
Only two studies [52,55] reported cost-effectiveness data. These studies were related, testing the same 12 month tailored-print intervention against different conditions (tailored-telephone [55]; tailored-internet [52]). The cost of delivering the tailored-print intervention ($35.81 per month per participant [52]) was consistent between studies. In the study comparing tailored print to tailored telephone calls [55], print was found to be more cost-effective at 12 months in terms of the cost of moving one person out of sedentary behaviour ($955 for the print group and $3, 967 for the telephone group) [55]. Likewise, in the tailored-print versus tailored internet study [52], print was reported as more cost-efficient at 12 months in terms of intervention delivery costs ($439 per participants per year compared to $1470.29). However, it was noted that the internet intervention may be less costly per participant if the number of participants was increased (i.e. assuming the same additional costs for each added participant the internet intervention would be less costly than the print condition when N > 352). Of note for intervention developers, the tailored print and tailored-internet interventions cost $10, 742 and $109, 564 (USD) respectively, to develop.

Discussion
This systematic review advances the field of knowledge on the efficacy of first generation tailored-print interventions in promoting PA behaviour in adults. Whilst the small number of relevant published studies needs to be considered when drawing conclusions from the review, it provides evidence for the efficacy of tailored-print interventions for enhancing aerobic PA participation in adults. Both single-contact and multiple-contact studies of reasonable methodological quality have demonstrated they can be efficacious in promoting PA behaviour in the mid and long-term. Nevertheless, the magnitude of the effect is unclear and evidence is restricted only to aerobic PA and assessed mostly in the mid-term.

What do these studies tell us about optimum intervention intensity?
The delivery of more than one tailored-print material seems to be a key determinant of intervention efficacy, with multiple-contact studies showing superior effects compared to single-contact studies. This indicates that more intensive interventions, in terms of both contact and ability to provide relevant feedback, may be more efficacious. Exactly how many tailored-print materials should be delivered and in what timeframe, is difficult to determine due to the heterogeneity of studies, the limited number of effect-size calculations and the lack of post-intervention follow-ups in multiple-contact studies. This finding is consistent with previous research [16,19].

One important consideration, from a public health perspective, is that optimal intervention intensity may be dependent on participant characteristics, with single-
contact interventions sufficient for individuals ready or able to make behaviour changes but not for individuals with higher needs. This would explain why positive intervention effects in single-contact studies were limited to those conducted with self-referred healthy adults and not those conducted with sedentary and ‘at risk’ individuals. Furthermore, this would explain why motivated ‘at risk’ participants responded more positively to the intervention [43] and why they were more likely to increase PA that they enjoyed [37]. Hence, the search for an ‘optimal intensity’ may be population and behaviour specific.

What do these studies tell us about the constructs used to tailor messages?
To date, much remains unknown about what specific aspects of tailoring contribute to the effectiveness of tailored messages. This is known as “the black box of tailoring”. In the reviewed studies, tailored messages were primarily composed of messages pertaining to PA behaviour and psychosocial constructs, drawn from a handful of behaviour change theories. Overall, the constructs used to tailor messages between studies were similar but there was some variability in how the constructs were used that may explain the differential intervention effects. For example, the theoretical construct ‘stage of change’ was used to decide: who would receive information about PA at all [37,39]; which information was emphasised [43]; and how feedback on other constructs, such as self-efficacy, would be delivered [44,46]. The relative effectiveness of these approaches is unclear, although it seems that using the stage of change construct to determine what to emphasise or how to present information is more effective than using it to screen participants. There was also variability in the type of feedback or information given for each construct. For example, behavioural feedback seemed to be more effective when it was based on individual progress rather than when it was based on comparisons with perceived level of activity or current guidelines.

Given that the majority of studies were ‘theory-based’, they should provide some insight into how tailoring ‘works’, that is, theory should provide a common description of what is known within an organising system [66]. Unfortunately, in many studies, theory was used as a ‘loose framework’, with theoretical constructs rather than theory used to guide the development and delivery of the intervention and such constructs not always considered in the analysis and interpretation of study outcomes.

Another factor contributing to the ‘black box’ of tailoring is the lack of analysis regarding the mediators and moderators of intervention effects. Whilst some studies reported these analyses, there were too few to draw specific conclusions about why tailoring ‘worked’. Self-efficacy appears to be an important construct, but the evidence is inconclusive. There was also evidence that tailored-print interventions based on these constructs work equivalently for people with different levels of PA at baseline. This highlights the potential for tailored-print interventions to play a significant role in PA maintenance as well as initiation.

Generalisability of the findings
Although this is the most comprehensive review of the efficacy of tailored-print interventions to promote PA behaviour change in adults, several factors may impact on the generalisability of its findings. First, the findings are based on a small number of studies (12) of predominately middle-aged, inactive females. Second, the review did not include grey literature (i.e., unpublished studies), hence publication bias may be an issue. However, given the number of published studies with null findings or small effect sizes, we believe publication bias is unlikely. Third, the included studies were limited to those focused on primary prevention. Several tertiary interventions were identified, but these were excluded because they included additional intervention components that made it impossible to isolate the effects of the tailored-print components. Fourth, it was beyond the resources of this project to include papers published in languages other than English. Finally, the methodological review conducted as a part of this study revealed several methodological weaknesses that should be considered when interpreting the generalisability of our findings. Despite these factors, this review provides significant insight into the state of the evidence and highlights key directions for future research.

Future directions
Future consideration should be given to (1) the theoretical underpinnings of tailored-interventions; (2) how we can determine which components of tailored interventions are important; (3) the impact of different intervention intensities; (4) the most appropriate comparison groups in tests of intervention efficacy in terms of both PA outcomes and cost; (5) what population parameters, if any, are predictive of success in tailored-print interventions; and finally (6) the type of PA that should be promoted and how it should be measured.

A move towards Social Cognitive Theories
All but one of the interventions in this review explicitly referred to the TTM as forming a part of the theory-base for the intervention. This is not surprising, in that the TTM offers an intuitive way to tailor information. However, since many of these studies were conducted, the use of the TTM in the PA domain has become controversial, with suggestions that there is little evidence
that stage-based interventions are effective in the long-term [67]. Furthermore, reviews of tailoring research have shown that interventions that are developed based on social cognitive theories are most effective [16,19]. This was supported in this review with studies underpinned by Social Cognitive Theory or The Theory of Planned Behaviour demonstrating more positive effects. Future research should focus on operationalising these social cognitive theories by mapping the theoretically derived determinants (psycho-social constructs) to behaviour change techniques that can be used in a distance-based and tailored setting (see Michie et al. [68,69]). Intervention developers should also consider selecting behaviour change techniques that have known efficacy in terms of positive increases in PA and associated determinants [70-73]. For example, there is increasing evidence that targeting self-regulation constructs is a promising approach [72,74]. Finally, researchers should detail this process so that there is transparency about how the theoretical underpinnings guided the development of the intervention and to determine the extent to which the interventions were tailored.

**Mediator analyses**
Future studies should seek to identify what tailoring components lead to successful outcomes by conducting appropriate mediation analyses and interpreting results (in light of these analyses) and the theory used to guide the development of the intervention.

**Optimum intervention intensity**
Whilst there is growing evidence that multiple contact studies are more efficacious than single contact studies, there is still only limited information about the optimal number of intervention contacts and the optimum delivery schedule in multiple contact studies. Intervention developers should base intervention intensity decisions on what is known about the population and report effect sizes for both immediate and long-term follow-ups.

**Distance-based intervention alternatives**
Due to the predominant use of no-information or generic information control groups and the limited reporting of effect-sizes, the reviewed studies provide only limited information as to whether tailored-print interventions are comparative in efficacy to other promising interventions, such as targeted-print interventions or second and third generation tailored interventions (eg tailored websites, emails, text messages). The comparison between targeted-print materials and tailored-print materials is particularly important. Targeted materials (those aimed at specific subgroups) are less resource intensive (in terms of both time and cost) and may be equally efficacious in promoting health behaviour change, especially when the target group is somewhat homogenous in terms of demographics, psychosocial characteristics and behavioural patterns. As effective print-based interventions are needed, future research should focus on determining the relative effectiveness and cost-benefit of these two approaches. More research is also needed comparing tailored interventions delivered via different channels or mixed model methods (e.g. complete an online survey and receive a tailored letter via the mail). In all cases, comparison interventions should be rigorously developed and theory-based and the costs associated with development and delivery should be reported where possible.

**Diverse target populations and moderator analyses**
The majority of participants included in the trials summarised in this review were white middle-aged sedentary women. Future research should focus on whether or not tailored-print approaches are effective in other target populations, such as in tertiary prevention, with younger populations or with already active individuals (to facilitate maintenance). Future research should aim to test the generalisability of our results by testing the efficacy of tailored-print interventions in understudied and diverse populations and by conducting moderator analyses that highlight which specific sub-groups interventions were most efficacious in. These analyses could then inform the development of both tailored and targeted intervention materials.

**Addressing common problems in PA research**
Future studies aiming to promote PA participation should consider targeting both aerobic and strength based physical activities. Furthermore, in light of the new evidence surrounding sedentary behaviour [4-6], PA could be promoted in a way that breaks up time spent sitting or laying down during waking hours. This requires a shift in focus from looking at the total amount of PA to the pattern of activity each day and a subsequent change in measurement tools.

All of the studies included in this review relied upon subjective measures of PA. Future studies should include objective and sensitive PA measures; for example accelerometers and pedometers (with a diary) may be particularly useful, especially for determining the pattern of PA behaviour. Future studies should also consider the length of follow-up necessary to inform policy makers and health practitioners on the sustainability of the effects. Several of the reported multiple-contact studies did not include post-intervention follow-ups; and where they were included, they were of no longer than 6 months post-intervention. Given the tendency for relapse once intervention support is withdrawn, the follow-up periods in these studies are inadequate for assessing the long-term efficacy of the intervention. Furthermore, given that PA benefits are obtained from sustained and regular participation, future studies should be powered to assess multiple follow-up periods over an...
extended period of time, inclusive of short, medium and long-term follow-up periods.

Conclusion
There is preliminary evidence that tailored-print interventions are a promising approach to promoting PA in adult populations. Future research is needed to determine if this approach is cost-effective and sustainable in the long-term, especially in comparison to other distance-based interventions showing potential, such as targeted-print interventions or other tailored interventions. This systematic review can serve as a guide to researchers and practitioners interested in understanding and/or developing tailored interventions in the PA domain.

Conflicts of interest
The authors declare that they have no competing interests.

Additional material

Additional file 1: Table 1: Summary table of study and intervention characteristics. The data provides a summary of each study regarding the following areas: Context/setting and sample characteristics; Intervention characteristics & control condition; Study design & evaluation Method; Outcome measures; and Key Findings.

Acknowledgements
This research was jointly funded by the Cancer Council New South Wales and the Cancer Institute NSW Research Scholar Award awarded to CS. Infrastructure support was provided by the University of Newcastle and the Hunter Medical Research Institute. Our gratitude is extended to Sarah Costigan for her assistance with the methodological review.

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Authors’ contributions
CS participated in the design of the study, reviewed the literature and drafted and revised the manuscript. EJ and RP participated in the design and coordination of the study, and revised and edited the manuscript. AG participated in the co-ordination of the study and revised and edited the manuscript. All authors have read and approved the final manuscript.

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References


42. van Stralen MM, Kok G, de Vries H, Mulder AN, Bolman C, Lechner L. The effectiveness of involvement on the responses to tailored feedback and action plans in an intervention addressing physical activity. Health Education Research.


44. Marcus BH, Napolitano MA, King AC, Lewis BA, Whiteley JA, Albrecht AE, Parisi AF, Bock BC, Pinto BM, Sciamanna CN, et al. Examination of print and telephone channels for physical activity promotion: Rationale, design, and baseline data from Project STRIDE. Contemporary Clinical Trials 2007, 28:90-104.


73. Williams SL, French DP: What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour and are they the same? Health Education Research 2011, 26:308-322.


doi:10.1186/1479-5868-8-113

Appendix 1.2: Methodological review tool
QUALITY ASSESSMENT TOOL FOR QUANTITATIVE STUDIES

COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?
   1 Very likely
   2 Somewhat likely
   3 Not likely
   4 Can’t tell

(Q2) What percentage of selected individuals agreed to participate?
   1 80 - 100% agreement
   2 60 – 79% agreement
   3 less than 60% agreement
   4 Not applicable
   5 Can’t tell

RATE THIS SECTION STRONG MODERATE WEAK
See dictionary 1 2 3

B) STUDY DESIGN

Indicate the study design
   1 Randomized controlled trial
   2 Controlled clinical trial
   3 Cohort analytic (two group pre + post)
   4 Case-control
   5 Cohort (one group pre + post (before and after))
   6 Interrupted time series
   7 Other specify ____________________________
   8 Can’t tell

Was the study described as randomized? If NO, go to Component C.
   No  Yes

If Yes, was the method of randomization described? (See dictionary)
   No  Yes

If Yes, was the method appropriate? (See dictionary)
   No  Yes

RATE THIS SECTION STRONG MODERATE WEAK
See dictionary 1 2 3
C) CONFOUNDERS

(Q1) Were there important differences between groups prior to the intervention?
1. Yes
2. No
3. Can’t tell

The following are examples of confounders:
1. Race
2. Sex
3. Marital status/family
4. Age
5. SES (income or class)
6. Education
7. Health status
8. Pre-intervention score on outcome measure

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?
1. 80 – 100% (most)
2. 60 – 79% (some)
3. Less than 60% (few or none)
4. Can’t Tell

RATE THIS SECTION | STRONG | MODERATE | WEAK
--- | --- | --- | ---
See dictionary | 1 | 2 | 3

D) BLINDING

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?
1. Yes
2. No
3. Can’t tell

(Q2) Were the study participants aware of the research question?
1. Yes
2. No
3. Can’t tell

RATE THIS SECTION | STRONG | MODERATE | WEAK
--- | --- | --- | ---
See dictionary | 1 | 2 | 3

E) DATA COLLECTION METHODS

(Q1) Were data collection tools shown to be valid?
1. Yes
2. No
3. Can’t tell

(Q2) Were data collection tools shown to be reliable?
1. Yes
2. No
3. Can’t tell

RATE THIS SECTION | STRONG | MODERATE | WEAK
--- | --- | --- | ---
See dictionary | 1 | 2 | 3
F) WITHDRAWALS AND DROP-OUTS
(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?
1 Yes
2 No
3 Can’t tell
4 Not Applicable (i.e. one time surveys or interviews)
(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).
1 80 -100%
2 60 - 79%
3 less than 60%
4 Can’t tell
5 Not Applicable (i.e. Retrospective case-control)

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<td>See dictionary</td>
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G) INTERVENTION INTEGRITY
(Q1) What percentage of participants received the allocated intervention or exposure of interest?
1 80 -100%
2 60 - 79%
3 less than 60%
4 Can’t tell
(Q2) Was the consistency of the intervention measured?
1 Yes
2 No
3 Can’t tell
(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?
4 Yes
5 No
6 Can’t tell

H) ANALYSES
(Q1) Indicate the unit of allocation (circle one)
community organization/institution practice/office individual
(Q2) Indicate the unit of analysis (circle one)
community organization/institution practice/office individual
(Q3) Are the statistical methods appropriate for the study design?
1 Yes
2 No
3 Can’t tell
(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?
1 Yes
2 No
3 Can’t tell
GLOBAL RATING

COMPONENT RATINGS
Please transcribe the information from the gray boxes on pages 1-4 onto this page. See dictionary on how to rate this section.

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GLOBAL RATING FOR THIS PAPER (circle one):

1 STRONG (no WEAK ratings)
2 MODERATE (one WEAK rating)
3 WEAK (two or more WEAK ratings)

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No
Yes

If yes, indicate the reason for the discrepancy

1 Oversight
2 Differences in interpretation of criteria
3 Differences in interpretation of study

**Final decision of both reviewers (circle one):**

1 STRONG
2 MODERATE
3 WEAK
The purpose of this dictionary is to describe items in the tool thereby assisting raters to score study quality. Due to under-reporting or lack of clarity in the primary study, raters will need to make judgements about the extent that bias may be present. When making judgements about each component, raters should form their opinion based upon information contained in the study rather than making inferences about what the authors intended.

A) SELECTION BIAS

(Q1) Participants are more likely to be representative of the target population if they are randomly selected from a comprehensive list of individuals in the target population (score very likely). They may not be representative if they are referred from a source (e.g. clinic) in a systematic manner (score somewhat likely) or self-referred (score not likely).

(Q2) Refers to the % of subjects in the control and intervention groups that agreed to participate in the study before they were assigned to intervention or control groups.

B) STUDY DESIGN

In this section, raters assess the likelihood of bias due to the allocation process in an experimental study. For observational studies, raters assess the extent that assessments of exposure and outcome are likely to be independent. Generally, the type of design is a good indicator of the extent of bias. In stronger designs, an equivalent control group is present and the allocation process is such that the investigators are unable to predict the sequence.

Randomized Controlled Trial (RCT)
An experimental design where investigators randomly allocate eligible people to an intervention or control group. A rater should describe a study as an RCT if the randomization sequence allows each study participant to have the same chance of receiving each intervention and the investigators could not predict which intervention was next. If the investigators do not describe the allocation process and only use the words ‘random’ or ‘randomly’, the study is described as a controlled clinical trial.

See below for more details.

Was the study described as randomized?
Score YES, if the authors used words such as random allocation, randomly assigned, and random assignment.
Score NO, if no mention of randomization is made.

Was the method of randomization described?
Score YES, if the authors describe any method used to generate a random allocation sequence.
Score NO, if the authors do not describe the allocation method or describe methods of allocation such as alternation, case record numbers, dates of birth, day of the week, and any allocation procedure that is entirely transparent before assignment, such as an open list of random numbers of assignments.
If NO is scored, then the study is a controlled clinical trial.
Was the method appropriate?

Score YES, if the randomization sequence allowed each study participant to have the same chance of receiving each intervention and the investigators could not predict which intervention was next. Examples of appropriate approaches include assignment of subjects by a central office unaware of subject characteristics, or sequentially numbered, sealed, opaque envelopes.

Score NO, if the randomization sequence is open to the individuals responsible for recruiting and allocating participants or providing the intervention, since those individuals can influence the allocation process, either knowingly or unknowingly.

If NO is scored, then the study is a controlled clinical trial.

Controlled Clinical Trial (CCT)
An experimental study design where the method of allocating study subjects to intervention or control groups is open to individuals responsible for recruiting subjects or providing the intervention. The method of allocation is transparent before assignment, e.g., an open list of random numbers or allocation by date of birth, etc.

Cohort analytic (two group pre and post)
An observational study design where groups are assembled according to whether or not exposure to the intervention has occurred. Exposure to the intervention is not under the control of the investigators. Study groups might be non-equivalent or not comparable on some feature that affects outcome.

Case control study
A retrospective study design where the investigators gather “cases” of people who already have the outcome of interest and “controls” who do not. Both groups are then questioned or their records examined about whether they received the intervention exposure of interest.

Cohort (one group pre + post (before and after)
The same group is pretested, given an intervention, and tested immediately after the intervention. The intervention group, by means of the pretest, act as their own control group.

Interrupted time series
A time series consists of multiple observations over time. Observations can be on the same units (e.g., individuals over time) or on different but similar units (e.g., student achievement scores for particular grade and school). Interrupted time series analysis requires knowing the specific point in the series when an intervention occurred.

C) CONFOUNDERS

By definition, a confounder is a variable that is associated with the intervention or exposure and causally related to the outcome of interest. Even in a robust study design, groups may not be balanced with respect to important variables prior to the intervention. The authors should indicate if confounders were controlled in the design (by stratification or matching) or in the analysis. If the allocation to intervention and control groups is randomized, the authors must report that the groups were balanced at baseline with respect to confounders (either in the text or a table).

D) BLINDING

(Q1) Assessors should be described as blinded to which participants were in the control and intervention groups. The purpose of blinding the outcome assessors (who might also be the care providers) is to protect against detection bias.

(Q2) Study participants should not be aware of (i.e., blinded to) the research question. The purpose of blinding the participants is to protect against reporting bias.
E) DATA COLLECTION METHODS

Tools for primary outcome measures must be described as reliable and valid. If ‘face’ validity or ‘content’ validity has been demonstrated, this is acceptable. Some sources from which data may be collected are described below:

- **Self reported data** includes data that is collected from participants in the study (e.g. completing a questionnaire, survey, answering questions during an interview, etc.).
- **Assessment/Screening** includes objective data that is retrieved by the researchers (e.g. observations by investigators).
- **Medical Records/Vital Statistics** refers to the types of formal records used for the extraction of the data.

Reliability and validity can be reported in the study or in a separate study. For example, some standard assessment tools have known reliability and validity.

F) WITHDRAWALS AND DROP-OUTS

Score **YES** if the authors describe BOTH the numbers and reasons for withdrawals and drop-outs.

Score **NO** if either the numbers or reasons for withdrawals and drop-outs are not reported.

The percentage of participants completing the study refers to the % of subjects remaining in the study at the final data collection period in all groups (i.e. control and intervention groups).

G) INTERVENTION INTEGRITY

The number of participants receiving the intended intervention should be noted (consider both frequency and intensity). For example, the authors may have reported that at least 80 percent of the participants received the complete intervention. The authors should describe a method of measuring if the intervention was provided to all participants the same way. As well, the authors should indicate if subjects received an unintended intervention that may have influenced the outcomes. For example, co-intervention occurs when the study group receives an additional intervention (other than that intended). In this case, it is possible that the effect of the intervention may be over-estimated. Contamination refers to situations where the control group accidentally receives the study intervention. This could result in an under-estimation of the impact of the intervention.

H) ANALYSIS APPROPRIATE TO QUESTION

Was the quantitative analysis appropriate to the research question being asked?

An intention-to-treat analysis is one in which all the participants in a trial are analyzed according to the intervention to which they were allocated, whether they received it or not. Intention-to-treat analyses are favoured in assessments of effectiveness as they mirror the noncompliance and treatment changes that are likely to occur when the intervention is used in practice, and because of the risk of attrition bias when participants are excluded from the analysis.
Component Ratings of Study:

For each of the six components A – F, use the following descriptions as a roadmap.

A) SELECTION BIAS

Strong: The selected individuals are very likely to be representative of the target population (Q1 is 1) and there is greater than 80% participation (Q2 is 1).

Moderate: The selected individuals are at least somewhat likely to be representative of the target population (Q1 is 1 or 2); and there is 60 - 79% participation (Q2 is 2). ‘Moderate’ may also be assigned if Q1 is 1 or 2 and Q2 is 3 (can’t tell).

Weak: The selected individuals are not likely to be representative of the target population (Q1 is 3); or there is less than 60% participation (Q2 is 3) or selection is not described (Q1 is 4); and the level of participation is not described (Q2 is 5).

B) DESIGN

Strong: will be assigned to those articles that described RCTs and CCTs.

Moderate: will be assigned to those that described a cohort analytic study, a case control study, a cohort design, or an interrupted time series.

Weak: will be assigned to those that used any other method or did not state the method used.

C) CONFOUNDERS

Strong: will be assigned to those articles that controlled for at least 80% of relevant confounders (Q1 is 1); or (Q2 is 1).

Moderate: will be given to those studies that controlled for 60 – 79% of relevant confounders (Q1 is 1) and (Q2 is 2).

Weak: will be assigned when less than 60% of relevant confounders were controlled (Q1 is 1) and (Q2 is 3) or control of confounders was not described (Q1 is 3) and (Q2 is 4).

D) BLINDING

Strong: The outcome assessor is not aware of the intervention status of participants (Q1 is 2); and the study participants are not aware of the research question (Q2 is 2).

Moderate: The outcome assessor is not aware of the intervention status of participants (Q1 is 2); or the study participants are not aware of the research question (Q2 is 2); or blinding is not described (Q1 is 3 and Q2 is 3).

Weak: The outcome assessor is aware of the intervention status of participants (Q1 is 1); and the study participants are aware of the research question (Q2 is 1).

E) DATA COLLECTION METHODS

Strong: The data collection tools have been shown to be valid (Q1 is 1); and the data collection tools have been shown to be reliable (Q2 is 1).

Moderate: The data collection tools have been shown to be valid (Q1 is 1); and the data collection tools have not been shown to be reliable (Q2 is 2) or reliability is not described (Q2 is 3).

Weak: The data collection tools have not been shown to be valid (Q1 is 2) or both reliability and validity are not described (Q1 is 3 and Q2 is 3).

F) WITHDRAWALS AND DROP-OUTS - a rating of:

Strong: will be assigned when the follow-up rate is 80% or greater (Q2 is 1).

Moderate: will be assigned when the follow-up rate is 60 – 79% (Q2 is 2) OR Q2 is 3 (N/A).

Weak: will be assigned when a follow-up rate is less than 60% (Q2 is 3) or if the withdrawals and drop-outs were not described (Q2 is 4).
Appendix 1.3: Statements of contribution from co-authors
Statement of contribution

I, Erica L. James, attest that Research Higher Degree candidate Camille E Short contributed substantially- in terms of study concept and design, literature searching and analysis, and preparation of the manuscript- to the publication:


16 April 2013

A/Prof. Erica L. James (Co-author)                         Date

Camille E Short (Candidate)                                Date

(Assistant Dean Research Training)                        Date
Statement of contribution

I, Ronald C Plotnikoff, attest that Research Higher Degree candidate Camille E Short contributed substantially- in terms of study concept and design, literature searching and analysis, and preparation of the manuscript-to the publication:


Prof Ronald C Plotnikoff (Co-author)  
21/02/12  
Date

Camille E Short (Candidate)  
24/04/13  
Date

(Assistant Dean Research Training)  
7/6/13  
Date
Statement of contribution

I, Afaf Girgis, attest that Research Higher Degree candidate Camille E Short contributed substantially- in terms of study concept and design, literature searching and analysis, and preparation of the manuscript-to the publication:


Prof Afaf Girgis (Co-author) [Signature] 28/2/13 Date

Camille E Short (Candidate) [Signature] 29/4/13 Date

(Assistant Dean Research Training) [Signature] 3/5/13 Date
Appendix 2

All documents in this Appendix relate to the manuscript presented in chapter 3 of volume 1:

‘A quantitative synthesis of trials promoting physical activity behaviour change among post-treatment breast cancer survivors’
Appendix 2.1: Article screening tool
A systematic review of health behaviour change trials for physical activity promotion among breast cancer survivors

<table>
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<tr>
<th>Date</th>
<th>Reviewer</th>
<th>Trial ID</th>
<th>Study title</th>
<th>First Author</th>
<th>Year of Publication</th>
<th>Any other relevant publications (eg. protocol papers) used for eligibility assessment</th>
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Eligibility & inclusion criteria – start eligibility assessment at top of table. STOP if paper is excluded

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**Participants**
Female adults (18 years or over) with a previous diagnosis of breast cancer who are not currently on active treatment (defined as chemotherapy, surgery, radiotherapy, but NOT including hormone therapy).

**Intervention**
Any intervention designed to increase any type of PA (aerobic, resistance, flexibility).

**Outcome**
An explicitly stated (primary or secondary) behaviour change outcome related to physical activity, measured via self-report or objective measurement, or both.

**Comparator**
A concurrent (parallel) comparison group

**Study design**
Study must be randomised controlled trial (RCT).

Pending further info from author ☐ ➔ author emailed with request on ________

**FINAL DECISION:** Include ☐ Exclude ☐
Appendix 2.2: Data Extraction Form
## Aims, recruitment and eligibility

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<tr>
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## Methods of recruitment of participants

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<td><em>How were potential participants approached and invited to participate?</em></td>
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## Inclusion/exclusion criteria for participation in study

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## Study design

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<td><em>Did stratification occur? If so, describe (e.g. stratified by treatment type)</em></td>
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<th>Blinding – outcome assesses</th>
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<td><em>Were outcome assesses blinded to participant’s group allocation?</em></td>
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<td><em>Were participants aware of the research aims? Were participants aware of what group they were assigned to?</em></td>
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<td>Intervention(s)</td>
<td>Location</td>
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<tr>
<td><strong>Intervention setting</strong>&lt;br&gt;Describe where the intervention(s) took place.</td>
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<td><strong>Theory base</strong>&lt;br&gt;Was the intervention described as theory-based? What theory was used?</td>
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<td>If applicable complete the following:&lt;br&gt;<strong>Control group setting</strong> <em>(hospital, participants home)</em>:</td>
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<td>Primary outcome</td>
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<td><em>Briefly describe the primary outcome of the study (e.g. enhance QOL, PA)</em></td>
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<td>Physical Activity Behaviour(s)</td>
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<td>*Describe what (if any) physical activity behavior(s) was assessed and describe the method of assessment <em>e.g. mins/week of aerobic activity – Physical Activity Recall (PAR).</em></td>
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<td>PA Outcome classification</td>
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<td><em>Describe why PA was measured (e.g. as a primary outcome, secondary outcome, to check compliance with the intervention, to include as a covariate).</em></td>
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<td>Diet Behaviour(s)</td>
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<td>*Describe what (if any) diet behavior(s) was assessed and describe the method of assessment <em>e.g. serves/day of fruit – Food Frequency Questionnaire.</em></td>
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<td><em>Were the methods of assessment described as valid and reliable?</em></td>
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<td>Diet Outcome classification (as above)</td>
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</table>
**Follow up periods**

Please specify when physical activity/diet behaviours were measured in terms of time since baseline and time since intervention.

*e.g. 6 months post-baseline (2 months post-intervention)*

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<th>Analysis (please describe in brief the primary analysis method) (e.g. Ancova, with baseline PA as a covariate).</th>
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<td>Describe the Method used for accounting for missing data (e.g. intention-to-treat analysis, completers analysis)</td>
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<td>Power/sample size calculation (e.g power was based on mins/wk as the primary outcome. To detect a 15 minute change in PA between groups with 80% power, we would need 38 participants in each group).</td>
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<th>Mediation analysis conducted?</th>
<th>Yes</th>
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<tr>
<td>Moderation analysis conducted?</td>
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<td>Cost analysis conducted?</td>
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## Results

### Recruitment, withdrawal and participant characteristics

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<th>Response rate</th>
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<td><em>What percentage of selected individuals agreed to participate?</em></td>
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| N |
| *How many participants were randomly assigned? i.e. what was the sample size at the beginning of the study* |

| Withdrawals and drop-outs |
| *How many people withdrew/dropped out from the study? Were there differences between the study groups?* |

| Age (mean, SD): |

| Gender: % female |

| Cancer type: report % recruited if mixed cancer group (e.g. 25% breast cancer survivors; 75% colorectal) |

| Time since diagnosis/ Time since curative treatment |

<p>| Treatments (e.g. % undergone chemo. % using hormone therapy) |</p>
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<tr>
<th>Outcome</th>
<th>Timing of outcome (days/month)</th>
<th>Intervention</th>
<th>PRE INTERVENTION</th>
<th>POST INTERVENTION</th>
<th>Adjusted effect and a measure of it's variability (e.g., for dichotomous this could be an odds ratio or risk ratio with 95% CI)</th>
<th>CHANGE FROM BASELINE</th>
<th>% and a measure of it's variability (SD and/or, SE and/or, 95% CI)</th>
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**Table Notes:**
- **Observed n (# of events)**: The number of events observed in the pre-intervention and post-intervention phases.
- **Total N**: The total number of participants or observations.
- **%**: The percentage of events observed.
- **Effect (describe and provide the point estimate)**: The effect size and its estimate, along with measures of variability such as 95% CI.
- **SD**, **SE**, and **95% CI**: Standard deviation, standard error, and 95% confidence interval for the effect size.
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<th>Adjusted effect and a measure of it's variability (SD and/or, SE and/or, 95%CI) – eg for cluster trials</th>
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Appendix 2.3: Statements of contribution from co-authors
Statement of contribution

I, Erica L James, attest that Research Higher Degree candidate Camille E Short contributed substantially—in terms of study concept and design, and preparation of the manuscript—to the publication:


16 April 2013

A/Prof. Erica L James (Co-author) Date

Camille E Short (Candidate) Date

(Assistant Dean Research Training) Date
Statement of contribution

I, Fiona Stacey, attest that Research Higher Degree candidate Camille E Short contributed substantially- in terms of study concept and design, and preparation of the manuscript-to the publication:


16 April 2013

Ms Fiona Stacey (Co-author) 

Camille E Short (Candidate) 

(Assistant Dean Research Training) 

Date
Statement of contribution

I, Ronald C Plotnikoff, attest that Research Higher Degree candidate Camille E Short contributed substantially— in terms of study concept and design, and preparation of the manuscript— to the publication:


16 April 2013

Prof. Ronald Plotnikoff (Co-author)  
Date  

Camille E Short (Candidate)  
Date  

(assistant Dean Research Training)  
Date
Appendix 3

All documents in this Appendix relate to the manuscript presented in chapter 4 of volume 1:

‘How Social Cognitive Theory can help oncology-based health professionals promote physical activity among breast cancer survivors’
Appendix 3.1: Published Manuscript

Citation: Short C, James E, Plotnikoff R. How Social Cognitive Theory can help oncology-based health professionals promote physical activity among breast cancer survivors. European Journal of Oncology Nursing, 2012. DOI:

http://dx.doi.org/10.1016/j.ejon.2012.10.009
How Social Cognitive Theory can help oncology-based health professionals promote physical activity among breast cancer survivors

C.E. Short a,⁎, E.L. James a, R.C. Plotnikoff b

a School of Medicine and Public Health, Priority Research Centre for Health Behaviour, University of Newcastle, NSW 2308, Australia
b School of Education, Priority Research Centre for Physical Activity and Nutrition, University of Newcastle, Callaghan, Australia

Abstract

Purpose: The majority of post treatment breast cancer survivors do not engage in physical activity (PA) at the recommended level. The promotion of PA among this group has the potential to dramatically improve quality of life and health outcomes. To maximise effectiveness, programs should be theory-based and address key determinants of PA behaviour. Social Cognitive Theory (SCT) has shown particular promise for developing and guiding PA interventions, but future research regarding how each SCT construct relates to PA among this group is needed. This study aims to explore how core SCT constructs impact on PA participation among post treatment breast cancer survivors, and gain greater insights into how to shape PA program strategies that will be appealing and effective for this group.

Methods: Post treatment breast cancer survivors were recruited from the Breast Cancer Network Australia's review and survey group. Semi-structured telephone interviews examined PA patterns and SCT constructs and data were analysed thematically.

Results: Eight post treatment breast cancer survivors participated in the study. Changes in activity level since diagnosis were common; in most cases this reflected a decline in PA. Key social cognitive and environmental influences on PA were described under the following themes: knowledge, outcome expectations, self-efficacy and personal, behavioural and environment facilitators and inhibitors.

Conclusion: The results of this study demonstrate the utility of SCT for guiding PA programs. Insight into how social cognitive factors may influence PA behaviour in this group is offered and direction for how oncology-based health professionals can promote PA among breast cancer survivors is provided.

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Introduction

There is a steadily growing population of breast cancer survivors worldwide (World Cancer Research Fund/American Institute for Cancer Research, 2007). Unfortunately, for many women survivorship encompasses a significant level of burden and disability both initially and long after the treatment phase is complete (Wolff, 2007). This burden is not currently being addressed as a part of routine cancer care and many survivors have significant unmet needs (Demark-Wahnefried et al., 2000; Jones and Courneya, 2002; Segar et al., 1998; Young-McCaughan & Sexton, 1991). Effective health promotion aiming to improve the quality of life and negate the health risks associated with survivorship among this group is needed.

One promising cancer control strategy is the promotion of regular physical activity (PA) (Hayes et al., 2009; Schmitz et al., 2010). PA can address both the psychological and physiological burdens presented after breast cancer diagnosis and treatment (Aziz and Rowland, 2003; Chlebowski, 2007). PA may also have an impact on survival, with a growing body of observational research indicating that breast cancer survivors who are active after treatment have a lower risk of cancer recurrence, co-morbidities and death from all causes compared to those who are less active, regardless of cancer stage (Holick et al., 2008; Holmes et al., 2005; Lynch, 2010; Lynch et al., 2010). In recognition of these benefits, detailed PA prescriptions guidelines designed to maximise outcomes for cancer survivors have been published by experts in the field (Hayes et al., 2009; Schmitz et al., 2010). Previous research has shown that a recommendation to exercise from a health professional does lead to increases in PA among breast cancer survivors (Jones et al., 2004). Unfortunately however, at present the vast majority of survivors do not receive any PA advice or support...
from their treatment team (Demark-Wahnefried et al., 2000; Jones and Courneya, 2002; Segar et al., 1998; Young-McCaughan & Sexton, 1991) and most do not engage in PA at a level sufficient to improve cancer outcomes (Eakin et al., 2007; Lynch et al., 2010). This may be due, at least in part, to the lack of evidence-based services that effectively promote regular and sustained PA among this group (Hayes et al., 2009). To support oncology-based health professionals promote PA, programs offering PA advice and support to cancer survivors are needed.

There is a growing recognition that theory-based behaviour change interventions are more effective than atheoretical approaches (Glanz and Bishop, 2010). Theories of behaviour change can help pinpoint what factors need to be considered before developing the program and can provide insight into how to shape program strategies to address these factors. Furthermore, theory-based interventions, unlike atheoretical approaches, can be tested in a way that provides information on how or why the intervention works. This increases the utility of the findings to others in the field and boosts the overall public health impact of the program (Bartholomew et al., 1998; Michie and Abraham, 2004). Hence, there is a strong rationale for designing PA programs for this group that are developed and implemented based on sound behavioural theories (Glanz et al., 2002).

One theory that has shown particular promise in this field is Social Cognitive Theory [SCT] (Bandura, 1986, 2004). SCT recognises the important dynamic and reciprocal relationship between behavioural, personal and environmental influences on behaviour, and offers ways of translating knowledge about these determinants into effective strategies for promoting behaviour change (Bandura, 2004; Baranowski et al., 2002). According to Bandura (2004), the core determinants that influence an individual’s behaviour include knowledge of the health risks and benefits (which is a pre-condition for change), self-efficacy (a person’s confidence in their control over performing a particular behaviour, which plays a central role in behaviour change), outcome expectations about the expected costs and benefits of performing the behaviour (which impacts on motivation), goals people set for themselves and their plans for achieving set goals (which provides self-incentive and guides action), and perceived facilitators and impediments to making behaviour changes, which can be behavioural, personal and/or environmental in nature (Bandura, 2004).

Whilst SCT is a promising theory and has been used to guide effective interventions (Demark-Wahnefried et al., 2006; Matthews et al., 2007; Pinto et al., 2005; Rogers et al., 2009), the application of SCT to the promotion of PA among breast cancer survivors is still in its infancy (Pinto and Ciccolo, 2011). For interventions to be evidence-based, further research is needed to explore what specifically should be addressed within each construct (i.e., to operationalize SCT for intervention development). For example, whilst the construct outcome expectations indicates that breast cancer survivors beliefs about the costs and benefits of participating in PA will impact on motivation, evidence is lacking regarding what specific outcome expectations may be particularly important to consider in this group (Rogers et al., 2004). Pioneering qualitative research by Rogers et al. (2004) has explored each SCT construct among breast cancer patients during the treatment phase, but no such studies have been conducted during the distinct ‘survivorship’ phase (the period following first diagnosis and treatment and prior to the development of a recurrence of cancer or death) (Courneya and Friedenreich, 2007; Feuerstein, 2007). As PA promotion can help negate many of the burdens and risks associated with survivorship in this phase, it is important that attention is focused on the specific factors (within each SCT construct) that may impact on or be related to PA in this group so that they can be addressed.

The current study aims to address this knowledge gap by exploring SCT constructs among post treatment survivors using a qualitative framework similar to Rogers et al. (2004). The secondary aim is to synthesise this information in a way that will be useful for intervention developers and health practitioners working within oncology.

Method

Recruitment

English speaking women aged over 18 who had been diagnosed with breast cancer and who were not currently undergoing ‘active’ cancer treatment (defined as surgery, chemotherapy, radiotherapy) were eligible to take part in the study. There were no other exclusion or inclusion criteria. Before approaching potential participants an estimate of the required sample size needed to reach saturation was conducted (Mason, 2010). Several factors known to impact on saturation were considered, including the scope of the study, the nature of the topic and the likely quality and amount of data obtained by each participant (Morse, 1994, 2000). As the present study builds on previous research, is narrow in scope and as high quality data is expected due to the sampling frame, it was predicted that a relatively small sample would be required. As a precaution, we aimed to recruit double the minimum sample size (i.e., at least six participants; Morse, 1994) recommended for qualitative research.

Participants were recruited from the Breast Cancer Network Australia’s (BCNA; www.bcna.org.au) review and survey group, which consists of over 800 volunteers that meet the study eligibility criteria. As a response rate of approximately 28% was expected (based on previous research with this sampling frame) no other sampling frames were considered. In an attempt to recruit twelve participants, forty four women were randomly selected and sent a study information pack and consent form by BCNA on behalf of the research team. Information packs were re-sent two weeks thereafter to provide non-responders with the opportunity to take part in the study. Importantly, more invitations could be sent to other BCNA review and survey group members if requested by the research team. This was not necessary as theoretical saturation was reached after eight interviews.

Procedure

Semi-structured, telephone interviews were conducted and audio-taped. Telephone interviews were chosen over other interview methods due to the geographical dispersion of participants and evidence that this type of analysis can provide rich and detailed data (Sturges and Hanrahan, 2004; Sweet, 2002), comparable to the data obtained from in-person interviews (Sturges and Hanrahan, 2004) (viewed as the “gold standard” for qualitative research (McCoyd and Kerson, 2006)).

Prior to conducting interviews with participants, practice interviews were conducted with two consumer representatives (including a BCNA consumer advocate) to provide the interviewer with an opportunity to practice interview skills and refine the interview materials if necessary. All interviews were conducted by one researcher (CS) who holds behavioural science qualifications and has experience working with cancer survivors. Each interview ran for approximately 45 min.

Discussion guide

Interview questions exploring SCT constructs were adapted from Rogers et al. (2004) qualitative study among breast cancer survivors, European Journal of Oncology Nursing (2012), http://dx.doi.org/10.1016/j.ejon.2012.10.009

Please cite this article in press as: Short, C.E., et al., How Social Cognitive Theory can help oncology-based health professionals promote physical activity among breast cancer survivors, European Journal of Oncology Nursing (2012), http://dx.doi.org/10.1016/j.ejon.2012.10.009
patients undergoing treatment (see Table 2 in Rogers et al., 2004 for example questions). Roger’s questions were based on Bandura’s original description of SCT (Bandura, 1986), which included separate core constructs relating to several facilitators and impediments (i.e., environment, situation, observational learning, reinforcements, emotional coping responses). We adapted these questions to fit within Bandura’s updated framework (with fewer core constructs; i.e., knowledge, self-efficacy, expectations, goals, and facilitators and impediments) (Bandura, 2004) and to be more appropriate for use with post treatment breast cancer survivors (e.g., all references to activity “during treatment” were removed). Example questions and a definition of each construct examined are provided in Table 2. Questions examining other factors of interest, such as demographics and cancer history were also included. PA behaviour was explored by asking participants “can you tell me a bit about how active you are?” and prompts querying participants about time spent sitting, and pre-diagnosis activity levels.

Some changes were made to the original version of the discussion guide based on feedback from the practice sessions with consumer representatives. Specifically, the introductory section was reduced to limit participant burden, the order of the questions was restructured (PA questions moved to the front and cancer history questions moved to the back to allow participants time to settle in to the interview and build rapport with the interviewer before answering more emotionally difficult questions), and repetitive questions eliciting similar responses (e.g., ‘what would be required for you to participate in an exercise program’ and ‘what do you think it would take for you to increase your physical activity’) were identified and removed/adapted. The final version of the discussion guide was approved by the University of Newcastle Human Research Ethics Committee and a BCNA staff member before interviewing participants.

Data analysis

Data collection and analysis were conducted between December 2010 and June 2011. Interview audio-tapes were transcribed verbatim by a research assistant. Participants were given the opportunity to read the interview transcript and edit any of the comments if they desired. Audio and text versions of the interviews were entered into the qualitative analysis software program, NVivo 9 (QSR International Pty Ltd., 2009), and analysed thematically using a theory driven code (Boyatzis, 1998) (based on pre-existing descriptions of SCT constructs (Bandura, 2004; Baranowski et al., 2002), which reflected the main sections of the interview guide). Each response was reviewed line by line and considered in the context of the surrounding text. To ensure the trustworthiness of the categorised themes the first three interviews were coded independently by two members of the research team (CS, EJ). Results of the independent analyses were compared and discrepancies discussed until agreement was reached on thematic classification. The remaining transcripts were then coded independently by one of the coders (CS). An audit trail was kept of research design and data collection decisions, and the steps taken to manage and analyse the data using a notes page in NVivo 9.

Results

Participants

Eight of the forty four breast cancer survivors invited to participate took part in the study. A summary of participant demographic and behavioural characteristics is provided in Table 1. In brief, all participants were married and had undergone both surgery and chemotherapy treatments. Most had also undergone radiotherapy and were receiving, or had received, hormone therapy. Participants were diverse in terms of age (ranging from 44 to 66), work status, education level, location, time since treatment, and current PA behaviours (see Table 1). Most participants were undertaking some planned aerobic activity throughout the week, ranging from planned activity (i.e., walking) once a week to regular planned sessions (i.e., walking, cycling, swimming, yoga). Two participants did not engage in any planned aerobic activity but reported regular incidental activity (i.e., walking at work). Most of the participants reported they had experienced a decline in PA levels since their diagnosis. For one participant this decline was experienced during the treatment period only and is now at pre-diagnosis levels. Only one participant reported that they have increased their PA level since being diagnosed.

Table 1

<table>
<thead>
<tr>
<th>Demographics</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean (range)</td>
<td>55 (44–63)</td>
</tr>
<tr>
<td>Marital status (count)</td>
<td>Married</td>
<td>8</td>
</tr>
<tr>
<td>Work status (count)</td>
<td>Full time</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Part time</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Casual</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
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<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>After high school</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Parent status</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Grandchildren</td>
<td>1</td>
</tr>
<tr>
<td>Location (count)</td>
<td>Major city</td>
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</tr>
<tr>
<td></td>
<td>Regional area</td>
<td>4</td>
</tr>
<tr>
<td>Cancer history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time since treatment (years)</td>
<td>Mean (range)</td>
<td>4 (3–6)</td>
</tr>
<tr>
<td>Treatment (count)</td>
<td>Chemotherapy</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Radiation</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Hormone treatment</td>
<td>5</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current PA</td>
<td>No leisure time PA</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Leisure time PA some days (cycle, walk)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Leisure time PA most days (swim, walk, yoga)</td>
<td>3</td>
</tr>
</tbody>
</table>

Themes from the theory-driven analysis are summarised here together with illustrative quotes from participants.

Knowledge

None of the participants were aware of what specific PA they should be doing to optimise cancer recovery and/or prevent a recurrence. However, most were aware more generally that regular PA is recommended to stay well and one participant was aware of the importance of weight bearing activities to maintain healthy bones after cancer treatment. Participants reported obtaining this information themselves from the internet or written materials. None of the participants had been provided with specific PA advice about exercising post treatment by anyone in their treatment team.

Mainly I just read about it in the little newsletter things that come around... that would be about the only information I get about how important exercise is and then if I go and look up on the internet they’ll generally say... but no medical people have ever mentioned it all. Doctors, surgeons, oncologist nobody! (Participant 1; 57 yrs old, 4 yrs post treatment).

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The majority of participants felt that there were no negative effects or costs of participating in PA that would impede their participation. Of exception however, one participant who was active prior to her diagnosis suggested that the mental costs of being active did not prevent her from getting cancer first place.

I know in my mind how much it took, how much energy it took to get to that way of thinking last time. I don’t want to expend that sort of energy on just thinking about getting into the right frame of mind to do it. I’ve looked at life from the other side and I think “well, gee whiz, no one is going to care when I’m dead ‘wasn’t she a physically active person’ or “wasn’t she this” or “wasn’t she that’ “. I’m doing things really for me, and that doesn’t necessarily include working into a lather of sweat on a treadmill or going around the block anymore. When I got cancer, I was the fittest that I have ever been. I think if I can get it when I’m really fit and strong and healthy, then I don’t think that exercise is actually going to keep me well. (Participant 4; 58 yrs old, 4 yrs post treatment).

Goals

Most of the participants had set some sort of PA goal for themselves in the past. For most participants, goal setting involved setting PA challenges for themselves whilst exercising and monitoring performance, rather than focussing on increasing PA participation. For some, setting challenges during PA increased enjoyment and resulted in a feeling of achievement.

What I do is I time myself or I’ll try and out swim the guy next to me. I push myself in that way. (Participant 6; 51 yrs old, 6 yrs post treatment).

A sense of achievement in a way...I used to go around the lake and do this 5.5 km and I actually got it down to 45 min or something when initially in took me 1 h and 10 min and I set my own targets and that to me was an achievement. (Participant 5; 63 yrs old, 4 yrs post diagnosis).

Some participants did set goals and plan to increase the amount of PA they were undertaking but had difficulty maintaining the goal behaviour over the long term.

I thought that if I set a plan and set a goal and stuck to it I’d get fitter and lose a little bit of weight. I went all gung-ho at the start and then it just fizzled. I had my little time schedule down. I was going to do my walk every morning and then I was just going to do an extra half an hour...I guess one day something came up so I couldn’t do it so the next day I thought “oh I can’t be bothered” and then you kind of get back into the bad habit of going “oh I’ve run out of time, I’ve got to cook dinner etc etc”. (Participant 1; 57 yrs old, 4 yrs post treatment).

Personal facilitators and impediments

Motivation

For the majority of participants, a lack of motivation was the main obstacle stopping them from engaging in PA. Some women felt like motivation was the only real obstacle and that other barriers were really “excuses”.

(In response to the question “what is the number one obstacle that interferes with your participation in PA?”) Lack of motivation, because the thing is I sort of say I am very time poor, for much of the year. But at the same time, you always find time to do the things you want to do so I sort of think, to sort of say that I am time poor I think it’s an excuse (Participant 2; 58 yrs old, 5 yrs post treatment).

Table 2

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
<th>Example question/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Knowledge of what PA to perform and possession of PA skills necessary to perform those activities</td>
<td>• What do you know about the PA recommendations for cancer survivors?</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Confidence in ability to engage in PA (task self-efficacy) and to overcome barriers to PA (barrier self-efficacy)</td>
<td>• How successful do you think you could be in participating in regular PA?</td>
</tr>
<tr>
<td>Expectations</td>
<td>Expected effects of PA behaviour</td>
<td>• Would you say that you are confident in your ability to perform regular PA?</td>
</tr>
<tr>
<td>Goals</td>
<td>Personal regulation of goal-directed PA behaviour, includes activities such as goal setting, self-monitoring, problem solving and self-reward</td>
<td>• What is the first thought that comes to your mind when you think about PA?</td>
</tr>
<tr>
<td>Perceived facilitators and impediments</td>
<td>Factors that influence (either positively or negatively) the PA behaviour of an individual</td>
<td>• Do you have plans to change your PA in the near future?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Have you ever set a PA goal?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• What is the number one obstacle that interferes with your participation in PA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Do you have people in your life who encourage you to participate in PA?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Is your local environment a pleasant environment for being active in?</td>
</tr>
</tbody>
</table>

Outcome expectations

The anticipated effects of participating in PA were predominantly positive. The most commonly anticipated benefits were enjoyment, increased energy, feeling good mentally and maintaining a healthy weight. Less frequently expressed positive expectations (although equally valued) were improvements in sleep, a sense of achievement, preventing cancer coming back, increased energy, feeling good mentally and physical functioning, such as existing injuries and/or environmental factors, such as the location and timing.

In the past I have been very successful. I certainly appear to be lacking a huge amount of motivation at the moment. (Participant 4; 58 yrs old, 4 yrs post treatment).

I could do it quite easily if I set it at a time to suit me. I’m not the sort of person who can join a gym, or go to a set class as a regular time because my working hours are too irregular for that. (Participant 3; 50 yrs old, 4 yrs post treatment).

Some participants did set goals and plan to increase the amount of PA they were undertaking but had difficulty maintaining the goal behaviour over the long term.

I thought that if I set a plan and set a goal and stuck to it I’d get fitter and lose a little bit of weight. I went all gung-ho at the start and then it just fizzled. I had my little time schedule down. I was going to do my walk every morning and then I was just going to do an extra half an hour...I guess one day something came up so I couldn’t do it so the next day I thought “oh I can’t be bothered” and then you kind of get back into the bad habit of going “oh I’ve run out of time, I’ve got to cook dinner etc etc”. (Participant 1; 57 yrs old, 4 yrs post treatment).

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For other women, a lack of motivation was compounded by other factors, such as health-issues, changes in perspective after cancer or not finding PA enjoyable.

I think it’s (cancer) just sort of changed my attitude a bit, with working full time as well I find it harder to find the time, but I find that my energy levels are lower and therefore I tend to conserve my energy for the more the immediate things… I’m not going to say the more important things, cause I think exercise is. But I you know, I do get tired a lot more quickly than I used to. (Participant 5; 63 yrs old, 4 yrs post treatment).

Health-issues

Health-related issues were identified by several participants as a key factor limiting their PA ability. Fatigue, arthritis, declines in physical functioning (relating to both age and cancer treatment), lymphoedema and body pain were the key issues.

Since I finished chemo I get fatigued very very quickly. (Participant 3; 50 yrs old, 4 yrs post treatment).

Arimidex has unfortunately given me sore hips so an hour’s walking is really about it and then I go okay now we stop. (Participant 1; 57 yrs old, 4 yrs post treatment).

Behavioural facilitators and impediments

Reinforcement

Some participants spoke about intrinsic rewards, such as feeling good after meeting the challenges they set for themselves, but more commonly participants spoke about negative reinforcers facilitating exercise, such as feeling guilty for not exercising.

I can be very hard on myself when I don’t exercise. I get very guilty about it. (Participant 7; 55 yrs old, 3 yrs post treatment).

Environmental facilitators and impediments

Social support

Social support was identified as an important motivator by the majority of participants. For two participants, the most important aspect of social support was having someone to exercise with and the social rewards of participating in PA with others.

That’s part of the reason for the walking group, it’s partly a social thing as well…it is getting out and talking to other people rather than just the kids (Participant 8; 44 yrs old, 5 yrs post treatment).

For the rest of the participants, having an exercise partner or performing PA with others was not a key concern. Rather, social support in the form of encouragement or having someone to “answer” appeared a more important motivating factor.

I would say the biggest motivation for me would be somebody pushing or having to answer to somebody if my friend rang up and said “Right, have you done your hours exercise today?” and tell you off if you don’t, that sort of thing. (Participant 1; 57 yrs old, 4 yrs post treatment).

Exercise preference may have had an impact on the kind of social support most valued, as the majority of participants reported a preference to exercise alone.

I would prefer to walk alone, because I find if I do walk with somebody else they walk too slow, ‘cause I’m a fast walker. (Participant 1; 57 yrs old, 4 yrs post treatment).

The local PA environment

Poor access to PA facilities was identified as a significant impediment. Several women reported that PA programs where either not available in their area or not available outside of work hours. The cost of attending PA facilities was also a barrier for some women.

There is nothing really close by either and that’s part of it, is having to get in the car and drive 20 min to go to somewhere. (Participant 8; 44 yrs old, 5 yrs post treatment).

I’ve always thought I’d enjoy Tai Chi, but again with working, the classes are held during the day and so that’s not possible. (Participant 2; 58 yrs old, 4 yrs post treatment).

The reason I don’t do it in like a gym or something is just the cost of going to the gym. (Participant 1; 57 yrs old, 4 yrs post treatment).

Local infrastructure and the surrounding area was also identified as having an impact on PA, with a lack of footpaths acting as an impediment for one participant and a pleasant PA environment acting as a facilitator for several participants.

The place we lived before it was a 50-min walk and it was terrific. I could walk up different streets and I wouldn’t have to go over the same ground twice, whereas here, where I live now you’ve sort of got to go out and back and yeah, I know it sounds funny and I know it’s probably just a copout but there’s no footpaths. It’s just not the same and I just don’t enjoy it. (Participant 2; 58 yrs old, 4 yrs post treatment).

I’m very fortunate where I live. I live across the road from a lake so I sort of do a huge stretch of the road and I finish by walking the length of the lake and coming home, so it’s a lovely walk. (Participant 7; 55 yrs old, 3 yrs post treatment).

Discussion

This investigation into the application of SCT (Bandura, 2004) among post treatment breast cancer survivors has built upon the previous work of Rogers et al. (2004) and provided some new insights into the potential social cognitive determinants of PA within this group. Although additional population-based research is needed to explore the generalizability of these findings to the growing breast cancer survivor population, the current study serves as a useful building block for future research. The significance of these findings are discussed below in the context of previous research, potential intervention implications and the need for further investigation.

Building on previous research

Rogers et al. (2004) examined the application of SCT to understanding exercise behaviour among a sample of breast cancer patients undergoing cancer treatment. Despite the marked difference in stage of cancer recovery between participants in the current study and those in Roger’s et al there was some overlap in how core SCT constructs potentially related to PA behaviour in both groups. For example, participants in both studies reported little knowledge about specific exercise guidelines for cancer survivors, felt confident in their ability to perform aerobic exercise and had predominantly positive expectations about engaging in PA for general health benefits. Hence, our study supports Roger’s recommendations that future exercise programs for the breast cancer population should include patient education to address knowledge gaps and should also emphasise the short-term benefits of activity most salient to the individual and the potential long-term cancer-specific
benefits (such as improved survival) individuals may not be aware of to enhance motivation. However, there were also some differences between the findings that should be acknowledged. First, whilst the impediments reported by participants overlapped, issues differed in salience. For example, Roger’s et al reported that fatigue was the most significant impediment to PA participation among patients, whereas participants in our study were more impeded by a lack of motivation, even though many reported significant health-related barriers. Second, patients in Roger’s study felt that specialized PA programs providing guidance by knowledgeable staff would help facilitate PA, whereas participants in the current study desired flexible programs that could be done in their own time. Whilst perhaps not surprising, these differences do suggest that addressing the preferences and needs of these two groups may require different interventions and intervention strategies. Third, Roger’s et al. (2004) explored the application of Bandura’s (1986) original SCT model. Although Rogers et al concluded that SCT is a useful framework for exploring exercise behaviours; some key findings relating to the breast cancer experience did not fit well within the model. For instance, Roger’s et al suggested that some expansion of the constructs was necessary to recognize health-related barriers within the core construct of “environment” and “self-efficacy”. In the present study, Bandura’s updated personal (2004) of SCT was applied. We found that applying Bandura’s updated model (Bandura, 2004) allowed for the inclusion of these medically-related factors (that we agree should be included) under the broader heading of facilitators and impediments, without expanding the existing constructs. Hence, it seems that Bandura’s updated model may be a more useful and valid framework for exploring PA behaviour among individuals with a history of breast cancer. Social support was identified as an important facilitator of PA behaviour in the current study. This is not unexpected, as previous research has consistently highlighted the benefits of having an exercise partner and/or a strong support network (generally) on exercise behaviour (Alfano et al., 2009; Emery et al., 2009). However, our findings suggest that appraisal support (Heney and Israel, 2002), such as offering encouragement and helping to monitor PA progress, may be an important aspect of social support to consider when developing PA intervention strategies. This may have particular benefit for those who prefer to exercise alone and are therefore less likely to benefit from or seek an exercise partner or group exercise option. To our knowledge, this aspect of social support has not been explored thoroughly among this population and warrants further investigation.

The period after a breast cancer diagnosis has been described as a ‘teachable moment’, whereby individuals are motivated to ‘take control’ by adopting healthy lifestyles (Demak-Wahnfried et al., 2005; McBride et al., 2000). This notion has been supported by some previous research, indicating that the desire to take control (e.g., ‘maintain a normal lifestyle’ and ‘gaining control over cancer’) can motivate cancer patients to exercise (Courneya and Friedenreich, 1999; Rogers et al., 2004). However, whilst some control taking behaviour was seen in our study, this did not always occur in the direction hypothesized. That is, some women ‘took control’ by choosing not topartake in PA and by choosing instead to participate in activities they enjoyed or that would conserve their energy. For these participants, the decision not to exercise seemed to be based on misconceptions about potential outcomes of PA. This may be an example of reciprocal determinism, whereby outcome expectation violations (e.g., PA won’t keep me well because it didn’t prevent me from getting cancer) and/or misconceptions (e.g., engaging in any PA will exacerbate fatigue) interact with personal inhibitors of PA behaviour (e.g., fatigue, lack of enjoyment for PA). Hence, our findings underscore the need to address expectation violations and/or misconceptions regarding the impact of PA on cancer related outcomes and cautions that such misconceptions may drive ‘teachable moments’, whereby people ‘take control’ by deciding not to adopt health behaviours. This is a novel finding that may have significant intervention implications for those wishing to capitalise on the ‘teachable moment’.

**Implications for practice**

Although preliminary, the results of this study provide some new insights that may have implication for practice. First, this study highlights the need to address knowledge gaps relating to how much and what kind of physical activities are needed to produce health gains. In particular, breast cancer survivors would benefit from receiving an exercise prescription recommending participation in both aerobic and resistance-activities at a level sufficient to meet the guidelines for cancer survivors. This information is available in publications by professional bodies (Hayes et al., 2009; Schmitz et al., 2010). Additional support for resistance training, addressing confidence (self-efficacy) to engage in resistance-based exercises may be required. Intervention approaches that are flexible and inexpensive, such as the provision of instructional print-material or DVDs or a session with a personal trainer are recommended. Second, the results also highlight the need for sensitivity when promoting PA among this group. Some survivors in the current study interpreted advice to exercise (provided by individuals in their social network) as pressure to ‘return to normal’. Care needs to be taken when giving advice not to reinforce guilty or negative feelings that may already exist and to acknowledge the breast cancer experience and associated barriers to exercise, especially when describing the benefits of PA and when providing feedback on current behaviour. Third, to encourage PA adoption and adherence, intervention strategies, locations and settings should be attractive, accessible and appealing and be tailored to meet the preferences and needs of individual’s within the group. Hence, we recommend against a ‘one sized fits all’ approach and recommend multiple intervention options and support avenues be made available.

To facilitate the development of SCT-based interventions targeting PA behaviours among breast cancer survivors, an exemplar of how SCT can be operationalized to promote PA among this group is presented in Table 3. The operationalization is based on the current study and previous research discussed above. Where possible, we have suggested intervention techniques with known efficacy for changing PA behaviour. For example, a recent review provided guidance on how to address these barriers.

**Table 3**

<table>
<thead>
<tr>
<th>Social Cognitive Theory constructs and implications for intervention development.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCT construct</strong></td>
</tr>
<tr>
<td>Knowledge</td>
</tr>
<tr>
<td>Outcome expectations</td>
</tr>
<tr>
<td>Self-efficacy</td>
</tr>
<tr>
<td>Goals</td>
</tr>
<tr>
<td>Facilitators and impediments</td>
</tr>
</tbody>
</table>
(Williams and French, 2011) concluded that ‘action planning’, ‘providing instruction’ and ‘reinforcing efforts towards behaviour’ were the most effective intervention techniques for increasing self-efficacy. Otherwise, intervention techniques are adapted from suggestions by Baranowski et al. (2002). This table offers a structural framework, which can be used to help guide the development of evidence-based PA promotion resources for breast cancer survivors. Adaptation of the framework may be needed for the development of interventions targeting breast cancer survivors in developing countries.

Strengths and limitations

A potential limitation of this study is that our interviews were semi-structured, which may be more likely to lead to prescriptive and leading questions. However, the questions in this study were carefully planned and adapted from other published work to avoid this problem and were considered necessary to gather the in-depth information considered important for intervention development. Another potential concern may be the small sample size. However, as anticipated, a small sample size was adequate to reach saturation in this study. We defined ‘new information’ or a ‘new theme’ as one not identified in the current study or previously by Rogers et al. (2004). This produced meaningful results that allowed us to proactively compare our findings with Roger’s in the analysis phase and highlight issues that may be specific to the post treatment phase.

The major strengths of this study are that it: (1) provides a greater understanding of the theoretical mechanisms of SCT as they relate to PA promotion among post treatment breast cancer survivors; (2) directs some insight into how these mechanisms could be addressed in SCT-based interventions among this group; and, (3) offers information useful for the development of SCT construct measures, necessary for testing and strengthening SCT via population-based research.

Suggestions for future research

Prior to the development of SCT-based interventions targeting PA behaviour among breast cancer survivors, future research exploring the generalizability of these findings in a representative population-based sample is recommended. Information regarding the prevalence of the social cognitive and environmental factors identified in the current study and in previous research will be particularly helpful and is necessary for the development of cost-effective public health approaches that target the most salient determinants of behaviour change.

Future exploratory research examining the application of SCT in other settings and/or among particular sub-groups of breast cancer survivors is also recommended. Findings from the current study may not be as applicable to very young or elderly breast cancer survivors or to those living in developing countries, as they were not represented in our sample. Hence, further examination of the social cognitive and environmental factors influencing PA in these groups is warranted.

Finally, we recommend that researchers develop measures of SCT constructs that reliably and validly capture the social cognitive and environmental influences of PA among breast cancer survivors. Such measures are necessary for capturing the prevalence of these factors in the breast cancer population and are also essential for testing and iteratively improving the ‘fit’ and strength of SCT to the application of PA behaviour change. We suggest, that in combination with Roger’s work (Rogers et al., 2004), this study can significantly inform this process.

Funding

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Conflict of interest

None reported.

Acknowledgements

Our gratitude is extended to the Breast Cancer Network Australia for their assistance engaging participants, Sue Maxwell and Suzanne Mullen for their assistance in developing the interview schedule, Dr Sylvie Lambert for her feedback on the manuscript and to Professor Afaf Girgis for her assistance with the study protocol.

References


QSR International Pty Ltd, 2009. NVivo.


Williams, S.L., French, D.P., 2011. What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour – and are they the same? Health Education Research 26 (2), 308–322.


Appendix 3.2: Information statement
Dear BCNA review and survey group member,

INFORMATION STATEMENT FOR THE RESEARCH PROJECT:
Move More for Life: Understanding breast cancer survivors’ thoughts and feelings about physical activity
Version 2; dated 21/06/10

We would like to invite you to participate in a telephone interview which is being conducted by researchers from the Centre for Health Research and Psycho-oncology. The Centre for Health Research & Psycho-oncology (CHeRP) is the behavioural research unit of the Cancer Council NSW and is based within the Faculty of Health at the University of Newcastle. The research is part of Ms Camille Short’s studies at the University of Newcastle, supervised by Professor Afaf Girgis, Professor Ron Plotnikoff and Dr Erica James.

Why is the research being done?  
Taking part in regular physical activity can help improve the health and well-being of breast cancer survivors. The research team is developing a program to promote and support physical activity in women who have been diagnosed with breast cancer, which they can use at home. We are looking for women to take part in a telephone interview to help us to be sure that the program we are developing will meet the specific needs of breast cancer survivors.

Who can participate in the research?  
Women aged over 18 who have been diagnosed with breast cancer at any time are invited to take part in this research. It doesn’t matter if you are already physically active or if you do not intend on changing your physical activity behaviour; you are still welcome to participate.

What choice do you have?  
Participation in this research is entirely your choice. Only those people who give their informed consent will be included in the project. Whether or not you decide to participate, your decision will not disadvantage you, or affect your medical care, or your relationship with the Breast Cancer Network Australia, in any way. If you do decide to participate, you may withdraw from the study at any time without giving a reason and you also have the option of withdrawing any data which identifies you.

What would you be asked to do?  
If you agree to participate, you will be asked take part in a telephone interview. You will be telephoned at your preferred time to discuss aspects of physical activity participation in a free and open manner. You will also be invited to answer some general questions about yourself and the cancer you were diagnosed with to help us understand the type of person who has participated in the study. The telephone interview will be conducted by Camille Short (Project Co-ordinator) of the Centre Health Research & Psycho-oncology. It is anticipated that the interview will take approximately 30-45 minutes.

What are the risks and benefits of participating?  
To help us better understand the physical activity needs of cancer survivors we will be asking you questions about your cancer diagnosis and physical capabilities. In general, the questions we ask should not be upsetting. However, if by chance you are concerned by any questions, you can choose
only to answer those questions you are comfortable with. The study facilitators will also be available
via telephone to discuss any questions or concerns with you; and if you wish, you will also be able to
contact the Cancer Council Helpline on 131120. This is a free and confidential telephone support
service staffed by experienced cancer health professionals. You will also be able to withdraw from
the study at anytime, without giving a reason.

**How will your privacy be protected?**
The interview will be audio taped with your consent and transcribed at a later date. Any identifying
information will be removed from the documents and audiotapes will not be made available to any
person outside the research team. Consent forms will be kept by the researcher in a locked filling
cabinet in a locked room. On completion of the study, paper documents will be stored in a locked
storage facility for a minimum of five years and electronic copies transcripts will be moved to CD-
ROM and stored in a locked storeroom for 15 years with the audiocassette.

Non-identifiable direct quotes may be used to communicate certain aspects of the research to the
public and the research community. Participants will be given the opportunity to read the interview
transcript and edit any of their comments if desired before the research is presented to the public.

**How will the information collected be used?**
The information we collect will be used to guide the development of the *Move More for Life*
program. We are trying to gain an in-depth understanding of what will encourage breast cancer
survivors to engage in physical activity; as well as their needs and preferences for the *Move More for
Life* program. The information we gather in the interview will help us to create a program that breast
cancer survivors will find acceptable and useful.

The information (non-identifiable) will also be published in peer-reviewed journals, presented at
academic conferences and may be promoted via media channels and the Cancer Council NSW. This
will allow others to benefit from the information gathered. It will also be included as part of
Camille’s Short’s PhD thesis.

**What do you need to do to participate?**
Please read this information statement and be sure you understand its contents before you consent to
participate. If there is anything you do not understand, or you have any questions, please contact the
research team.

If you would like to participate please complete the attached consent form and return it to us within
the next seven days in the reply paid envelope provided. If we don’t hear from you in seven days we
will send you another information pack as a reminder. This is to ensure you have the chance to
participate if you would like to. If you do not wish to receive a reminder letter you can contact
BCNA or us (and we will inform BCNA) on the free call number below. If you choose to participate
we will contact you within the next 4 weeks at a time nominated by you.

**Further information**
If you would like to know more about this project or have any questions please feel free to contact
Camille Short (Project Coordinator) or myself, by telephone: 1800 447 208 (freecall) or Email:
CHeRP-movemoreforlife@newcastle.edu.au.

This information sheet is for you to keep. Thank you for considering this invitation.

Yours sincerely
Centre for Health Research & Psycho-oncology (CHeRP)
Professor Afaf Girgis  
CHeRP Director & Project Supervisor

The Research Team  
Prof Afaf Girgis, Centre for Health Research and Psycho-oncology  
Prof Ron Plotnikoff, University of Newcastle  
Ms Camille Short (Research Student & Project Coordinator), Centre for Health Research and Psycho-oncology

Complaints about this research  
This project has been approved by the University’s Human Research Ethics Committee, Approval No. H-2010-1103. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au
Appendix 3.3: Consent form
I agree to participate in the above research project and give my consent freely.

I understand that the research will be conducted as described in the information statement, a copy of which I have retained.

I understand I can withdraw from the project at any time without giving any reason for withdrawing.

I consent to:
- Participate in a telephone interview that will take approximately 30-45 minutes to complete.
- Answer some general questions about me and the cancer I was diagnosed with.
- Having direct quotes from my interview used in research related communication, as long as I cannot be identified.

I understand that my personal information will remain confidential and accessible only to the researchers.

I understand that if I am directly quoted I will have the opportunity to edit such quotes and to ensure that they are non-identifiable.

I understand the telephone interview will be recorded on audiotape, and that I will be given the opportunity to obtain a written copy of the transcript to review my contribution.

I have had the opportunity to have questions answered to my satisfaction.

Name: ……………………………………………………………………..

Signature: ………………………………………………..Date………………

Telephone number:………………………………………………………

Please indicate the most convenient times for you to be contacted for the interview

Preferred days (eg Mondays & Tuesdays)………………………………………..

Preferred time (eg evenings after 6pm)…………………………………………

Please return this form in the reply paid envelope provided
Appendix 3.4: Ethics approval
HUMAN RESEARCH ETHICS COMMITTEE

APPROVAL TO CONDUCT HUMAN RESEARCH

To Chief Investigator or Project Supervisor: Associate Professor Erica James
Cc Co-investigators / Research Students: Ms Camille Short
                                            Conjoint Professor Afaf Girgis
                                            Professor Ronald Plotnikoff
Re Protocol: Move More for Life: A tailored physical activity program
            for Australian breast cancer survivors
Date: 30-May-2011
Reference No: H-2010-1103

Thank you for your recent application to the University of Newcastle Human Research Ethics Committee (HREC) for approval of the protocol identified above.

Details of previous approvals for Initial and Variation applications are included.

A Certificate of Approval is enclosed.

The Certificate and this advice are to be retained
They are important documents

- Note any comments related to the approval.
- Where the HREC is the lead or primary HREC, if the research requires the use of an Information Statement, ensure the Reference No. is inserted into the complaints paragraph in the approved document(s) prior to distribution to potential participants.
- Where the research is the project of a higher degree candidate, it is the responsibility of the project supervisor to ensure that the candidate receives this approval advice.

Conditions of Approval
This approval has been granted subject to you complying with the requirements for Monitoring of Progress, Reporting of Adverse Events, and Variations to the Approved Protocol as detailed below.

PLEASE NOTE:
In the case where the HREC has "noted" the approval of an External HREC, progress reports and reports of adverse events are to be submitted to the External HREC only. In the case of Variations to the approved protocol, you will apply to the External HREC for approval in the first instance and then Register that approval with the University's HREC.
- **Monitoring of Progress**

Other than above, the University is obliged to monitor the progress of research projects involving human participants to ensure that they are conducted according to the protocol as approved by the HREC. The *Certificate of Approval* identifies the period for which approval is granted and your progress report schedule. A progress report is required on an annual basis, you will be advised when a report is due.

- **Reporting of Adverse Events**

1. It is the responsibility of the person **first named on the Certificate** to report adverse events.

2. Adverse events, however minor, must be recorded by the investigator as observed by the investigator or as volunteered by a participant in the research. Full details are to be documented, whether or not the investigator, or his/her deputies, consider the event to be related to the research substance or procedure.

3. Serious or unforeseen adverse events that occur during the research or within six (6) months of completion of the research, must be reported by the person first named on the Certificate to the (HREC) by way of the Adverse Event Report form within 72 hours of the occurrence of the event or the investigator receiving advice of the event.

4. Serious adverse events are defined as:
   - Causing death, life threatening or serious disability.
   - Causing or prolonging hospitalisation.
   - Overdoses, cancers, congenital abnormalities, tissue damage, whether or not they are judged to be caused by the investigational agent or procedure.
   - Causing psycho-social and/or financial harm. This covers everything from perceived invasion of privacy, breach of confidentiality, or the diminution of social reputation, to the creation of psychological fears and trauma.
   - Any other event which might affect the continued ethical acceptability of the project.

5. Reports of adverse events must include:
   - Participant's study identification number;
   - date of birth;
   - date of entry into the study;
   - treatment arm (if applicable);
   - date of event;
   - details of event;
   - the investigator’s opinion as to whether the event is related to the research procedures; and
   - action taken in response to the event.
6. Adverse events which do not fall within the definition of serious, including those reported from other sites involved in the research, are to be reported in detail at the time of the annual progress report to the HREC.

- **Variations to approved protocol**

If you wish to change, or deviate from, the approved protocol, you will need to submit an *Application for Variation to Approved Human Research*. Variations may include, but are not limited to, changes or additions to investigators, study design, study population, number of participants, methods of recruitment, or participant information/consent documentation. **Variations must be approved by the (HREC) before they are implemented** except when Registering an approval of a variation from an external HREC which has been designated the lead HREC, in which case you may proceed as soon as you receive an acknowledgement of your Registration.

**Linkage of ethics approval to a new Grant**

HREC approvals cannot be assigned to a new grant or award (ie those that were not identified on the application for ethics approval) without confirmation of the approval from the Human Research Ethics Officer on behalf of the HREC.

With best wishes for a successful project.

Professor Alison Ferguson  
Chair, Human Research Ethics Committee

*For communications and enquiries:*  
**Human Research Ethics Administration**

Research Services  
Research Integrity Unit  
HA148, Hunter Building  
The University of Newcastle  
Callaghan NSW 2308  
T +61 2 492 18999  
F +61 2 492 17164  
Human-Ethics@newcastle.edu.au

**Linked University of Newcastle administered funding:**

<table>
<thead>
<tr>
<th>Funding body</th>
<th>Funding project title</th>
<th>First named investigator</th>
<th>Grant Ref</th>
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<tr>
<td>Cancer Institute NSW/Research Scholars Award(**)</td>
<td>Move More for Life: A tailored physical activity program for Australian breast cancer survivors</td>
<td>Girgis Alaf,</td>
<td>G1000475</td>
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</table>
HUMAN RESEARCH ETHICS COMMITTEE
Certificate of Approval

Applicant: (first named in application)  Associate Professor Erica James
Co-Investigators / Research Students:
  Ms Camille Short
  Conjoint Professor Afaf Girgis
  Professor Ronald Plotnikoff
Protocol:
  Move More for Life: A tailored physical activity program for Australian breast cancer survivors

In approving this protocol, the Human Research Ethics Committee (HREC) is of the opinion that the project complies with the provisions contained in the National Statement on Ethical Conduct in Human Research, 2007, and the requirements within this University relating to human research.

Note: Approval is granted subject to the requirements set out in the accompanying document Approval to Conduct Human Research, and any additional comments or conditions noted below.

Details of Approval

HREC Approval No: H-2010-1103  Date of Initial Approval: 15-Jul-2010

Approval will remain valid subject to the submission, and satisfactory assessment of annual progress reports. If the approval of an External HREC has been "noted" the approval period is as determined by that HREC.

Progress reports due: Annually.
  If the approval of an External HREC has been "noted", the reporting period is as determined by that HREC.

Approval Details

Initial Application
18-Aug-2010

Approved

The Committee ratified the approval granted by the Chair on 15/07/10 under the provisions for expedited review.

Variation
18-May-2011

Variation to:

1. Change the research design from a 2 arm randomised controlled trial (RCT) to a 3 arm RCT. The trial arms are now as follows:
   a. Tailored intervention group - participants receive 3 tailored letters (previously approved).
   b. Targeted intervention - participants receive an exercise guide for breast cancer survivors booklet (new).
   c. Wait-list control group - participants complete the data collection surveys but do not
receive intervention materials under data collection is complete (previously approved). Participants will now have a choice as to which intervention they eventually receive.

2. Eliminate the 7 month follow-up data collection point (data collection will now occur at baseline, 4 and 10 months).

3. Increase the total sample size to 414 participants (138 per study arm).

4. Expand the sources of recruitment to include: Cancer Council NSW; YWCA Encore; health professionals (eg, breast care nurses); attendance at events relevant to potential participants (eg, breast cancer forum); and snowball sampling where participants will pass on the invitation on behalf of the researchers.

- Information Statement (v4, dated 23/2/11)
- Recruitment Poster (v2, dated 4/4/11)
- Consent Form - Intervention Groups (v4, dated 25/2/11)

Approved
The Committee ratified the approval granted by the Human Research Ethics Officer on 06/04/11 under the provisions for expedited review.

Variation
08-Dec-2010
Variation to:

1. Add Associate Professor Erica James to the research team as Chief Investigator

2. Amend the eligibility criteria by excluding participants who are actively undergoing cancer treatment

3. Distribute recruitment information packs via e-mail instead of post

4. Amend the wording of the telephone interview script.

- Participant Information Statement (Telephone Interview), Version 3 dated 20.10.2010

- Interview Consent Form, Version 3 dated 20.10.10

- Telephone Interview Guide, Version 3 dated 21.10.10

- Participant Information Statement (Intervention), Version 2 dated 21.6.10

- Consent Form (Trial Intervention Group), Version 3 dated 21.10.10

- Par-Q-Information Sheet, Version 2 dated 21.10.10

- Pedometer Instructions, Version 2 dated 21.10.10

- Questionnaire (Controlled Trial), Version 3 dated 21.10.10
Approved
The committee ratified the approval granted by the chair on 23/11/2010 under the provisions for expedited review

Authorised Certificate held in Research Services

Professor Alison Ferguson
Chair, Human Research Ethics Committee
Appendix 3.5: Interview discussion guide
**Move More for Life: Understanding breast cancer survivors’ thoughts and feelings about physical activity**

**Telephone Interview Guide**

Good morning/afternoon/evening. My name is Camille. I’m calling on behalf of the University of Newcastle concerning some research. May I speak with _________ please?

*Obtain best time to call back if participant is not there*

Hello _________ (first name). I am calling in response to your interest in participating in the study about physical activity. You indicated on the consent form that_______ (day/time) is the best time for us to contact you for an interview.

- It will take approximately 30 minutes, is now an OK time for you to do the interview?
  
  Good. *If not obtain details of a more convenient time.*

- In your consent form you gave us permission to audio tape this interview. Is that still OK?
  
  Good I will tell you when I am turning the tape on and off. *If not then take written notes.*

Before we get started I’d like to remind you that the information you provide in this interview will remain confidential, and any publications or reports produced using the information will have all identifying characteristics removed. To make sure that we protect people’s privacy, try not to identify yourself or anyone else (such as health professionals) when the tape is recording. You may withdraw from the study at any time without giving me a reason. This information is available in the information sheet that was sent to your email.

**Introduction**

The interview will take about 30 minutes to complete. I’ll be asking you some questions about your general background, and how you feel, think and engage in physical activity. We’re particularly interested in your opinion about a physical activity program called *Move More for Life* that we are developing specifically for breast cancer survivors. There are no right or wrong answers - we are interested in your experiences and opinions. Do you have any questions before I begin?

**Is it OK for me to continue?**

**I am now turning ON the tape recorder**

First, I would like to ask you some questions about your participation in physical activity. Physical activity is the term we use for both planned, structured exercise sessions as well as other activity like gardening and housework”

1. Can you tell me a bit about how active you are?

*Potential prompts:*

- *Do you do much physical activity?*
- *What type of activities do you do? How often? How long do you do them for? What intensity? (Give information about light, moderate, hard intensity activity if needed).*
- *Were you active as a child?*
- *Has the amount of activity you do changed because of your diagnosis?*
- *Do you spend much time sitting down? How many hours of tv watching, reading etc do you do?*

**Questions relating to SCT – adapted from Rogers et al 2004**
OK, now I would like to ask you some questions about how you feel and think about physical activity.

**Self efficacy** (confidence in ability to engage in physical activity)

2. How successful do you think you could be in participating in regular physical activity?

*Potential prompts*
- Aerobic activities? – what types?
- Resistance activities? E.g. therabands, swimming, dumbbells, yoga, push-ups

Or it seems that you have been quite successful at participating in regular physical activity, would you say that you are confident in your ability to perform regular physical activity? What about activity of different types/intensities?

**External facilitators** *(Environment: factors influencing physical activity external to the individual)*

3. What is the number one obstacle that interferes with your participation in physical activity?

4. Are there any other things that stop you from being physically active or increasing your physical activity?

5. **For inactive people:** What would be required for you to participate in and comply with an exercise program?

6. Has your doctor provided you with any information concerning exercise and breast cancer?

*Prompt*
- What information have you been provided with?
- Has anyone else provided you with information?

7. Do you have people in your life who have encouraged you to participate in physical activity?

*Prompt:*
- Who by? Before or after your diagnosis? Why do you think they were encouraging you?
- Who do you interact with on a regular basis?

**Behavioural capability** *(knowledge of the type of physical activity needed and the skill to perform this activity)*

8. What do you know about physical activity recommendations for cancer survivors?

9. What type of exercise/physical activity have you found most enjoyable in the past?

*Prompt:*
- Has this changed since you diagnosis?

**Expectations** *(Expected effects of physical activity behaviour)*

10. What’s the first thought that comes to your mind when you think of PA/exercise?
11. What negative effects do you think PA/exercise might have on your body?

12. What positive effects do you think exercise may have on your body?

**Expectancies** (The value of an expected effect of PA to the individual)

13. Are any of these negative factors so important that they stop you from considering exercise?

14. What positive benefit of exercise is so important that you would be willing to exercise, even if you were so fatigued that you felt like you were walking in wet cement?

15. Repetitive with question 5. What do you think it would take for you to increase your physical activity?

**Goals** (setting a PA goal)

16. Have you ever set an exercise goal?

**Prompt:**
- *When was it that you set the goal?*
- *Did you achieve the goal you set?*

17. Do you have plans to change your activity level in the near future?

**Observational learning** (observing other breast cancer patients benefiting from physical activity)

18. If you were to meet a woman with breast cancer, what advice would you give her about exercise/PA?

19. *Have you heard many stories about women with breast cancer exercising?*

**Reinforcement** (internal and external).

20. In what ways have you rewarded yourself for PA/exercise in the past?

21. How do you currently reward yourself for PA/exercise?

22. Can you think of anything that has motivated you to participate in PA in the past?

**Questions relating to Built Environment**

Now I’d just like to ask you some questions about your neighbourhood. By neighbourhood I mean the area all around your home that you could walk to in 10-15 minutes.

23. Are shops, stores, markets or other places to buy things in easy walking distance from you home?
24. Is there a bus stop or train station within walking distance from your home?

25. Is there an open recreation area (such as a park) within easy walking distance of your home?

26. Is your local environment a pleasant environment for walking and cycling?

27. Do you have access to exercise and sports equipment at home or at work?

28. Does your workplace provide facilities to support you walking or cycling to work?

The Move More for Life Program

Thank you for telling me a bit about your participation in physical activity. This information will be useful to us for designing the Move More for Life program which aims to help women who have had breast cancer to become more active.

I’d now like to tell you a bit about the program and get some feedback from you.

In the Move More for Life program rather than face-to-face sessions, women will be asked to complete a survey and based on their answers, we will mail them personalised exercise advice. The personalised advice would include information on PA guidelines for cancer survivors, feedback on current activity levels and information on how to overcome specific barriers.

Does this type of program sound like something that would be useful to help you or other breast cancer survivors increase participation in physical activity?

Does it sound like something that you would be interested in?

29. Do you think we should include all the information in one long letter or do you think it would be better to get several letters over time giving you information on your progress?
   a. How many would you like to receive?
   b. How long would you like to receive them for?
      i. 1 month? 3 months?

30. The way in which we make the information specific to an individual is by getting them to fill out a survey. Would you be willing to fill out a 10-20 minute physical activity survey so that it could be used to generate the information?
   • How often would you be happy to do this?
   • Would you be happy to do this each month for three months?

31. Would you prefer to fill out a paper survey and send it back (for free) or would you prefer some other method of assessment like over the telephone or a web-based survey?

32. Would you rather receive the personalised information in the mail or via an email/website?

33. Another way we support PA is provide a web-based program including diaries and advice. Does this type of format appeal to you?
Do you have any questions you would like to ask or comments you would like to make?

To finish up I have a few quick questions about you and your cancer diagnosis ... Please remember you can ‘pass’ if you would prefer not to answer a particular question.

**Background Information**

34. Do you mind telling me what year you were born?
35. Do you live with anyone or do you live alone?
36. Are you in a relationship?
37. Did you do any formal education or training after high-school?
38. Do you currently work? Record part-time/full-time/student etc
39. Do you mind telling me your residential postcode?

**Cancer History**

40. What year where you diagnosed with breast cancer?
41. Was it your first cancer diagnosis?
42. Have you experienced a recurrence or been diagnosed with a different cancer?
43. What treatments did you have?
44. When did you have your last treatment?
45. Has your cancer diagnosis impacted on your priorities in life?
46. What are your most valued activities?

**Do you have anything you would like to say before I turn off the tape recorder?**

**I am now turning OFF the tape recorder**

Thank you for your help today and the time you have given. Do you have any questions before I go? Would you like the number of the Cancer Helpline for any questions relating to cancer? If you have any questions or concerns about the study please don’t hesitate to call me or another member of the research team on 1800 447 208. Would you like a written copy of this interview to review? Would you like to receive a summary of the study results?

Once again, thank you very much for all your help.

**Resources**

Cancer council helpline

- call 13 11 20:
- local call cost from anywhere in Australia
- is open between 9am and 5pm, Monday to Friday

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This project has been approved by the University’s Human Research Ethics Committee, Approval No. H-2010-1103
Appendix 3.6: Statements of contribution from co-authors
Statement of contribution

I, Erica L James, attest that Research Higher Degree candidate Camille E Short contributed substantially— in terms of study concept and design, and preparation of the manuscript—to the publication:


16 April 2013

A/Prof. Erica L James (Co-author) Date

Camille E Short (Candidate) Date

(Assistant Dean Research Training) Date
Statement of contribution

I, Ronald C Plotnikoff, attest that Research Higher Degree candidate Camille E Short contributed substantially in terms of study concept and design, literature searching and analysis, and preparation of the manuscript to the publication:


Prof Ronald C Plotnikoff (Co-author) 21/02/12 Date

Camille E Short (Candidate) 24/4/13 Date

(Address Dean Research Training) 3/5/13 Date
Appendix 4

All documents in this Appendix relate to the manuscript presented in chapter 5 of volume 1:

‘The theory and evidence-based development and evaluation of the Move More for Life program: A tailored-print intervention designed to promote physical activity among post-treatment breast cancer survivors’
Appendix 4.1: Newsletter design process, including original sketches and sample newsletters
Developing the visual design

Method

1. Look at print media often read by the target audience – copy best design features.
   - BCNA

2. Develop a simple grid for the pages.
   - Try and use the same grid for most or all of the pages (makes navigation between pages easier).
   - A very simple grid works best.

Sample page grids.
3. Verbal description of design and sketches that demonstrate specific visual elements.

- The overall feel of the newsletters:
  - Friendly, supportive, engaging
- The grid or other pattern being employed to tie together elements on each page:
  - Margins
  - Number of columns on each page
  - Position of headlines, messages and graphics
- The type styles to be used
  - Typeface
  - Size and style of various headline and body-text segments
- Graphics
  - tailored pictures
  - drawings
- Colours to be used
  - Purpose
  - Location
- Paper
  - A3, folded to make a 4 page A4 newsletter.
  - Weight, tba
  - Colour, tba

4. Developing the organisational framework

- Location and boundaries of each message block delimited (boundaries established).
- Should be designed in response to three imperatives:
  - Locating the message blocks according to their topic
    - Messages related topically should be related spatially.
  - Fitting the visual design just completed (or in progress)
    - Visual design includes organisational elements such as the layout, number of columns per page, horizontal or vertical flow of stories, and amount of white space. These dictate where message blocks can be placed on any given page.
  - Fitting the differing length of the different message blocks.
    - When placing message blocks on a page, enough space must be reserved to account for the largest possible version of each message.
    - Developing the design template concurrently with the message concepts makes this easier.

Sample organisational framework

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
</tr>
<tr>
<td>PA feedback</td>
</tr>
</tbody>
</table>
5. Creating Stationary pages

Looking for where we can have fixed elements

- If a spot has no tailored content (message block), a non-tailored colour element may be printed there. E.g. masthead, page number
- Graphic associated with the topic of a message block or a colourful headline can be included if this will stay the same across newsletters. E.g. expert for advice column
- Columns pre-printed in a different way e.g. printed in a different very light colour
- Set of stationary pages with fixed elements laid out and with the prepress characteristics (colour, screen values, paper stock etc) described.

Results

The first drafts of the newsletters, incorporating the above features, were created in pencil.

These drafts were then provided to an expert graphic designer who was briefed on the intervention aims and target population.

The graphic designer made some modifications to the overall structure of the draft newsletters, including:

- Position of headlines, messages and graphics
- The layout and grid formation.

The graphic designer developed the following aspects of the newsletters:

- Organisational elements such as the number of columns per page, horizontal or vertical flow of stories, and provided suggestions for increasing white space.
- The typeface and size and style of various headline and body-text segments
- The colour scheme
- The weight and texture of the paper
- Graphics (photos and illustrations).

The first and final draft of each newsletter is provided below.
Getting Help
If you would like help designing or re-evaluating your exercise program, consider making an appointment with an exercise physiologist or a certified exercise professional that is knowledgeable about breast cancer and its treatment. Contact Exercise and Sport Science Australia (details right) to find an exercise physiologist near you.

If you are worried about the cost, speak to your GP. You may be eligible for a Medicare rebate via an enhanced primary care plan.

Further Information and Support
The Cancer Council helpline
Ph: 13 11 20
Ask for information on the support and health care services available in your area.

YWCA Encore
Ph: 1800 200 150
Free 5 week gentle exercise program for breast cancer survivors.

Exercise and Sport Science Australia
Ph: (07) 3839 5672
They may be able to help you find an exercise physiologist in your area.

Active Australia
Ph: 0800 663 9027
Plan an active life!

Our Best Wishes
It has been a pleasure designing these newsletters for you and we hope that you have enjoyed reading them.

As you continue on your journey, remember that regular physical activity is an important part of cancer recovery and maintaining good health. For your social benefits to be maximized, a regular routine of exercise should continue even after your active recovery has ended.

By staying active and setting goals and a routine to exercise, you can help keep the benefits of living a more active lifestyle. If you would like more support or are interested in trying something new, you may want to contact one of the organizations listed below.

We wish you all the best,
The More For Life Team

Your Action Plan
Well done for setting another goal after newsletter 2. It is great to see you taking part in this important process. Don’t worry if it wasn’t achieved, you may just need to adjust your goals to make them more attainable.

Rewriting yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself - guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

[Blank space for goals and rewards]

Newsletter 3

Dear Anne,
Congratulations on your participation over the past three months, it has been great to see you exploring your ongoing commitment and interest in being physically active.

We hope you enjoy this final newsletter. Read on to discover helpful tips, advice and support on staying active.

Expert Advice
Dr Sandi Hayes is a National Breast Cancer Foundation Senior Research Fellow within the School of Public Health at the Queen’s University of Technology, and is also an experienced Exercise Physiologist. Her work is focused on how exercise can improve the lives of breast cancer survivors.

How much exercise is enough to obtain survival benefits?
There is still a lot to learn about the optimum amount of exercise to maintain survival benefits. We do know that for breast cancer survivors, exercise should be part of an overall healthy lifestyle.

How can exercise help reduce the risk of dying from breast cancer?
Research shows that moderate exercise can help reduce the risk of dying from breast cancer. Exercise may help improve immune function, lower body fat, and improve overall health and well-being.

Are most breast cancer survivors physically active?
We know that breast cancer survivors often have limited physical activity due to the treatment they receive. However, many survivors are now able to maintain a physically active lifestyle.

How and when should I progress?
As your syllabus and strength increases, your exercise routine will get easier. Adapting your program to your physical abilities and lifestyle is important to get the best out of your routine.

You can adapt your program by changing how often you exercise, the length of time you exercise, or by adding some intervals of harder work to your program. Make sure that you progress slowly and don’t try and change too much at once. Slow progress is best because it allows your body to adapt to the challenges presented by the exercises.
2-sided (non-tailored) Activity planner sheet sent with Newsletter 1.

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*Activity Planner*

Develop an action plan at the beginning of each week by writing down:

- **When** - the days you plan to do activity, and at what time.
- **What** - exactly what type of activity you plan to do and for how long.
- **Notes** - record whether you stuck with your plan each day, by colouring the smiley face. You can also write notes about how you went and how you felt after each activity to inform your next plan.
Appendix 4.2: Message concept booklet – Newsletter 1
Move More for Life

Message concept booklet

Newsletter 1

NB: This booklet contains the tailored messages to be used in Newsletter 1.
1. Welcome message (F_introduction1)

Location: Newsletter 1, Page 1

Message: Greeting

Communication objective:

1. Welcome the participant to the study.
2. Describe the purpose of the newsletter
3. Brief overview of newsletter contents
4. Encouragement to read the materials

Message parameters

Type: Micro-tailoring (programming language in text).
Length: Short (647-648 characters)
Origin: Based on Participant name (R_first.name)

*****************************************************************************

Dear “R_first.name”

Over the next 3 months, the Move More For Life team will provide you with personalised advice and feedback about keeping active after breast cancer.

Read on to find out how regular physical activity can benefit your health and help you to get the most out of life!

*****************************************************************************

Character count

326 characters (with spaces)
2. What is recommended? (F_Recommendation1)

Location: Newsletter 1, Page 1

Message: What is recommended?

Communication objective:

1. Describe the physical activity recommendations for cancer survivors

Message parameters

Type: generic message (NON-TAILORED)

Length: Character count: 1710 (with spaces)


Message concept: Describe the PA recommendations for cancer survivors

What is recommended for you?

Australian Physical Activity Guidelines for Cancer Survivors
These guidelines are based on detailed research and are designed to help cancer survivors stay healthy through regular exercise.

It is recommended that you*:

Engage in aerobic exercise:
- At least 3-5 times a week.
- At a moderate intensity.
- For at least 20-30 minutes continuously.

Engage in resistance-based exercise:
- 1-3 times a week, with rest days between sessions.
- Complete 6-10 exercises focusing on different muscle groups, 6-12 repetitions of each exercise, 1-4 sets per muscle group*. Begin with a low weight (1kg or less) and progress slowly.

You may notice that there is some variability in the guidelines, with upper and lower limits recommended. You can think of the lower limit as the recommended target level for de-conditioned survivors (i.e. those with reduced physical functioning, low fitness) and the upper limit as the recommended target for conditioned survivors.

Take a moment to stop and think about where you are at personally. Aim to exercise at a level that is suitable for your health and fitness. As your fitness and strength increases, you can gradually increase your level of physical activity.
3. Glossary of terms (F_Glossary1)

Location: Newsletter 1, Page 1 (bottom of page)
Message: Glossary of terms

Communication objective:
- Explain dimensions of physical activity to participants
  - Intensity
  - Type
  - Frequency

Message parameters
Type: Generic message (non-tailored)
Style: Message in text Box – visual element drawing attention
Length: 1060 (character count with spaces)
Origin: tailoring resources (Hayes, Cancer Council WA)

Physical Activity Glossary

*Aerobic exercises* use large muscle groups and cause your heart rate to rise during the exercise. Examples include walking, running, hiking, cycling, rowing and swimming.

*Resistance exercises* (sometimes called weight or strength training) use resistance to increase muscle strength and endurance. Examples include using machine weights (like the ones at the gym), free weights (e.g. dumbbells), body weight (e.g. push-ups) or therabands (i.e. long stretchy rubber bands).

*Exercise intensity* refers to how hard you exercise. Moderate intensity *aerobic* exercise is any exercise that makes you breathe harder without feeling out of breath (e.g. walking quickly like you are late for an appointment). If you are exercising at a moderate level of intensity you should also start to sweat after 10 minutes. For *resistance-training*, exercising at a moderate level of intensity means using weights that are equal to 50-80\% of the maximum amount of weight you can lift for a single repetition.

Character count 966 (with spaces)
4. Your Aerobic Physical Activity (F_Aerobic_performance1)

**Location:** Newsletter 1, Page 2

**Message:** Your Aerobic Physical Activity (F_Aerobic_performance1)

**Communication objective:**

1. Provide feedback on participants aerobic physical activity behaviour
   a. Current levels compared the guidelines
   b. Current level compared to pre-diagnosis level
2. Encourage physical activity plan appropriate for individual.

**Message parameters**

Type: Micro-tailoring (graph continuous physical activity scores)

Macro-tailoring (meeting guidelines or not)

Length: 964-1786 (with spaces)

Origin: Q1.a.a (section C); Q1.b.a (section C); Q1.a.b (section C); Q1.b.b (section C); Q6(section C); Q2 Section G

Survivorship research (e.g. women’s wellness study; Hayes lit summary):

**Broad Message concepts**

(1) **Changes in activity level from pre-to-post diagnosis impacts on health outcomes,** with those who increase their activity levels following a cancer diagnosis reducing their risk of death, while those who decrease their activity levels increase their risk four fold.

(2) **Participating in regular physical activity at a moderate intensity for 150 minutes per week improves health outcomes,** with those who meet the guidelines having a reduced risk of recurrence and death by up to half, when compared to those who are sedentary.

(3) **Any increase in moderate intensity physical activity is beneficial for health gains.**
(4) Individuals should start slow and progress at a pace that reflects their individual needs.

(5) Vigorous activity incurs greater benefit

Feedback variables (all possible messages within the message set):

| Test | Not meeting the aerobic guidelines (Defined as 150 minutes a week of moderate intensity over at least 5 sessions/accounting for extra benefit associated with vigorous activity) | Not at all limited – a little limited | Same activity as before diagnosis | If response to Q1a.a (section C) + response to Q1b.a (section C) = < 5 sessions AND response to Q1a.b(section C) (x2) + response to Q1b.b (section C) = < 150 minutes AND If response to Q2 (Section G) = < 3 AND IF response to Q6 (Section C) = 1 THEN Message 1

\[I_{PA1}.AR.Guid_{modvig} = 1 \text{ AND } R_{diability1} = < 3 \text{ AND } R_{PA.PD.AR}_{global} = 1 \text{ THEN MESSAGE 1}\] |
| Exercise more now | Not at all limited – a little limited | Same activity as before diagnosis | If response to Q1a.a (section C) + response to Q1b.a (section C) = < 5 sessions AND response to Q1a.b(section C) (x2) + response to Q1b.b (section C) = < 150 minutes AND If response to Q2 (section G) = < 3 AND IF response to Q6 (section C) = 2 THEN Message 2

\[I_{PA1}.AR.Guid_{modvig} = 1 \text{ AND } R_{diability1} = < 3 \text{ AND } R_{PA.PD.AR}_{global} = 2 \text{ THEN MESSAGE 2}\] |
| Exercise less now | Not at all limited – a little limited | Same activity as before diagnosis | If response to Q1a.a (section C) + response to Q1b.a (section C) = < 5 sessions AND response to Q1a.b(section C) (x2) + response to Q1b.b (section C) = < 150 minutes AND If response to Q2 (section G) = ≥ 3 AND response to Q6 (section C) = 1 THEN Message 3

\[I_{PA1}.AR.Guid_{modvig} = 1 \text{ AND } R_{diability1} = < 3 \text{ AND } R_{PA.PD.AR}_{global} = 3 \text{ THEN MESSAGE 3}\] |
| Somewhat limited- completely limited | Not at all limited – a little limited | Same activity as before diagnosis | If response to Q1a.a (section C) + response to Q1b.a (section C) = < 5 sessions AND response to Q1a.b(section C) (x2) + response to Q1b.b (section C) = < 150 minutes AND If response to Q2 (section G) = ≥ 3 AND IF response to Q6 (section C) = 1 THEN Message 4

\[I_{PA1}.AR.Guid_{modvig} = 1 \text{ AND } R_{diability1} = ≥ 3 \text{ AND } R_{PA.PD.AR}_{global} = 1 \text{ THEN MESSAGE 4}\] |
| Exercise more now | Not at all limited – a little limited | Same activity as before diagnosis | If response to Q1a.a (section C) + response to Q1b.a (section C) = < 5 sessions AND response to Q1a.b(section C) (x2) + response to Q1b.b (section C) = < 150 minutes AND If response to Q2 (section G) = ≥ 3 AND response to Q6 (section C) = 2 THEN Message 5

\[I_{PA1}.AR.Guid_{modvig} = 1 \text{ AND } R_{diability1} = ≥ 3 \text{ AND } R_{PA.PD.AR}_{global} = 2 \text{ THEN MESSAGE 5}\] |
| Exercise less now | Not at all limited – a little limited | Same activity as before diagnosis | If response to Q1a.a (section C) + response to Q1b.a (section C) = < 5 sessions AND response to Q1a.b(section C) (x2) + response to Q1b.b (section C) = < 150 minutes AND If response to Q2 (section G) = ≥ 3 AND response to Q6 (section C) = 3 THEN Message 6

\[I_{PA1}.AR.Guid_{modvig} = 1 \text{ AND } R_{diability1} = ≥ 3 \text{ AND } R_{PA.PD.AR}_{global} = 3 \text{ THEN MESSAGE 6}\] |
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<th>Current Activity</th>
<th>Response to Questions</th>
<th>Message</th>
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<td>More</td>
<td>Not at all limited – a little limited</td>
<td>If response to Q1.a.a (section C) + response to Q1.b.a (section C) ≥ 5 sessions AND response to Q1.b.b (section C) ≥150 minutes AND IF response to Q2 (section G) &lt; 3 AND IF response to Q6 (section C) = 1 THEN Message 7</td>
<td>I_PA1.AR.Guid_modvig = 1 AND R_diability1 = &lt; 3 AND R_PA.PD_AR_global = 1 THEN MESSAGE 7</td>
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<tr>
<td>More</td>
<td>Same activity as before diagnosis</td>
<td>If response to Q1.a.a (section C) + response to Q1.b.a (section C) ≥ 5 sessions AND response to Q1.b.b (section C) ≥150 minutes AND IF response to Q2 (section G) = &lt; 3 AND response to Q6 (section C) = 2 THEN Message 8</td>
<td>I_PA1.AR.Guid_modvig = 2 AND R_diability1 = &lt; 3 AND R_PA.PD_AR_global = 1 THEN MESSAGE 8</td>
</tr>
<tr>
<td>More</td>
<td>Somewhat limited – completely limited</td>
<td>If response to Q1.a.a (section C) + response to Q1.b.a (section C) ≥ 5 sessions AND response to Q1.b.b (section C) ≥150 minutes AND IF response to Q2 (section G) = ≥ 3 AND IF response to Q6 (section C) = 1 THEN Message 10</td>
<td>I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥ 3 AND R_PA.PD_AR_global = 1 THEN MESSAGE 10</td>
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<td>Less</td>
<td>Not at all limited – a little limited</td>
<td>If response to Q1.a.a (section C) + response to Q1.b.a (section C) ≥ 5 sessions AND response to Q1.b.b (section C) ≥150 minutes AND IF response to Q2 (section G) = ≥ 3 AND response to Q6 (section C) = 2 THEN Message 11</td>
<td>I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥ 3 AND R_PA.PD_AR_global = 2 THEN MESSAGE 11</td>
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<td>Less</td>
<td>Same activity as before diagnosis</td>
<td>If response to Q1.a.a (section C) + response to Q1.b.a (section C) ≥ 5 sessions AND response to Q1.b.b (section C) ≥150 minutes AND IF response to Q2 (section G) = ≥ 3 AND response to Q6 (section C) = 3 THEN Message 12</td>
<td>I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥ 3 AND R_PA.PD_AR_global = 3 THEN MESSAGE 12</td>
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<td>If response to Q1.a.a (section C) + response to Q1.b.a (section C) ≥ 5 sessions AND response to Q1.b.b (section C) ≥150 minutes AND IF response to Q2 (section G) = ≥ 3 AND response to Q6 (section C) = 3 THEN Message 12</td>
<td>I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥ 3 AND R_PA.PD_AR_global = 3 THEN MESSAGE 12</td>
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| Else If | Not limited | No value | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = < 3 AND response to Q6 (section C) = empty **\text{Message 13}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = < 3 AND R\_PA\_PD\_AR\_global = 4 THEN MESSAGE 13}}  
\text{Limited} | No value | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = < 3 AND response to Q6 (section C) = empty **\text{Message 14}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = < 3 AND R\_PA\_PD\_AR\_global = 4 THEN MESSAGE 14}}  
\text{Meeting the guidelines} | Not limited | No value | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = ≥ 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = ≥ 150 minutes AND **IF** response to Q2 (section G) = ≥ 3 AND response to Q6 (section C) = empty **\text{Message 15}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 2 AND R\_diability1 = < 3 AND R\_PA\_PD\_AR\_global = 4 THEN MESSAGE 15}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 1 **\text{Then message 17}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 1 THEN MESSAGE 17}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}  
\text{Less now} | No value | **Same as before** | **If** response to Q1.a (section C) + response to Q1.b.a (section C) = < 5 sessions AND response to Q1.a.b (section C) + response to Q1.b.b (section C) = < 150 minutes AND **IF** response to Q2 (section G) = empty AND response to Q6 (section C) = 3 **\text{Then message 19}**  
\text{\texttt{I\_PA1\_AR\_Guid\_modvig = 1 AND R\_diability1 = 6 AND R\_PA\_PD\_AR\_global = 3 THEN MESSAGE 19}}
### Meeting the guidelines

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| IF response to Q1a.a (section C) + response to Q1b.a (section C) = ≥5 sessions AND response to Q1a.b (section C) (s2) + response to Q1b.b (section C) = ≥150 minutes AND If response to Q2 (section G) = empty AND response to Q6 (section C) = 1 THEN **Message 20**  
Le 1 PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 1 THEN message 20 |

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IF response to Q2 (section G) = empty AND response to Q6 (section C) = 2 THEN **Message 21**  
Le 1 PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 2 THEN Message 21 |

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| IF response to Q1a.a (section C) + response to Q1b.a (section C) = ≥5 sessions AND response to Q1a.b (section C) (s2) + response to Q1b.b (section C) = ≥150 minutes  
IF response to Q2 (section G) = empty AND response to Q6 (section C) = 3 THEN **Message 22**  
Le 1 PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 3 THEN Message 22 |

### Not Meeting the guidelines

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Le 1 PA1.AR.Guid_modvig = 1 AND R_diability1 = 6 AND R_PA.PD_AR_global = 4 THEN message 23 |

### Meeting the guidelines

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Le 1 PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 4 THEN message 24 |

### ELSE

| DEFAULT MESSAGE |

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**Graphs** - Column graph

**Graph 1- Minutes**

Coloumn1.

- (raw) R_ R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min
  - (intermediate) I_PA1.AR.ST_Mod_Mins

Column 2

- Recommendation = 150 minutes (non-tailored)  

©
Graph 2 - Sessions

Column 1.

- (raw) R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess = total number of mod+vig sessions
  - (intermediate) I_PA1.AR.ST_Mod_Sessions

Column 2.

- Recommendation = 5 sessions (non tailored)

CONSISTENT:

HEADING: Your Aerobic Activity

Graph

Note: Time spent engaging in vigorous activity is multiplied by 2 to account for the additional benefits.

Character count: 107


Graph 1 Header: Average Number of Minutes Per Week
Graph 2 Header: Average Number of Sessions Per Week

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Message number: message 1

Message for person who is not meeting the guidelines, has not changed their activity level since they were diagnosis and is not limited in their ability to do so.

Main issue:

- Person is not meeting the aerobic physical activity guidelines.
- Person exercises the same amount now as before their diagnosis.
- Person’s health does not limit them from being active (self reported)

**Message:**

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, this just means that you will experience more improvement with increased activity. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.

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Characters: 818

**Message Number: Message 2**

*Message for person who is not meeting the guidelines, but has increased their activity level since diagnosis. This person is not limited.*

**Main issue:**

- Person is not meeting the aerobic physical activity guidelines.
- Person has increased the amount of physical activity.
- Person’s health does not limit them from being active (self reported)

**Message:**

Congratulations! You have increased your aerobic activity since your diagnosis with breast cancer. This is a great achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.

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770

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Message number: Message 3

Message for person who is not meeting the guidelines, is not physically limited but has reduced their activity level since diagnosis.

Main issue:

- Person is not meeting the aerobic physical activity guidelines.
- Person has reduced their activity level since diagnosis
- Person’s health does not limit them from being active (self reported)

Message concepts

Message:

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, there are lots of reasons why women become less active, especially after experiencing cancer. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.

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*Graph as above

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Message number: message 4

Message for person who is not meeting the guidelines, has not changed their activity level since they were diagnosis and has reported being limited

Main issue:

- Person is not meeting the aerobic physical activity guidelines.
- Person exercises the same amount now as before their diagnosis.
- Person may experience difficulty-increasing activity due to physical limitation.
- Person should be encouraged to start slow.

Message concepts
Message:

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, this just means that you will experience more improvement with increased activity. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. It is important to progress slowly and within your physical limits. This could mean shorter sessions or activity at a lighter intensity than that which is specified in the guidelines. Any increase in physical activity that is maintained is progress in the right direction.

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Characters 812

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Message Number: Message 5

Message for person who is not meeting the guidelines, but has increased their activity level since diagnosis, even though they report being somewhat limited physically.

Main issue:

- Person is not meeting the aerobic physical activity guidelines.
- Person has increased participation in physical activity
- Person may have difficulty increasing physical activity further due to limitation. Progression should be slow.

Message:

Congratulations! You have increased your aerobic activity since your diagnosis with breast cancer. This is a great achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. It is important to progress slowly and within your physical limits. This could mean shorter sessions or activity at a lighter intensity than that which is specified in the guidelines. Any increase in physical activity that is maintained is progress in the right direction.

An example goal for this week could be “On Thursday morning I will go for a 10 minute walk around my neighborhood. I’ll walk at a moderate intensity for at least the 5 minutes”.

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**Message number: Message 6**

*Message for person who is not meeting the guidelines, has reduced their activity level since diagnosis and reported being physically limited*

**Main issue:**

- Person is not meeting the aerobic physical activity guidelines.
- Person has reduced their activity level since diagnosis
- Person’s health may be limiting them from participating in physical activity.
  Person should be encouraged to increase PA gradually.

**Message:**

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, there are lots of reasons why women become less active, especially after experiencing cancer. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. It is important to progress slowly and within your physical limits. This could mean shorter sessions or activity at a lighter intensity than that which is specified in the guidelines. Any increase in physical activity that is maintained is progress in the right direction.

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**Message number: message 7**

*Message for person who is meeting the guidelines, has not changed their activity level since they were diagnosis and is not limited in their ability to do so.*

**Main issue:**

- Person is meeting the aerobic physical activity guidelines.
- Person exercises the same amount now as before their diagnosis.
- Person’s health does not limit them from being active (self reported)

**Message:**
Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to maintain your activity level and focus on getting the most out of your routine. Women who maintain or increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets or exceeds the guidelines.

Message Number: Message 8

Message for person who is meeting the guidelines, and has increased their activity level since diagnosis. This person is not limited.

Main issue:

- Message for person who is meeting the guidelines
- Person has increased activity since diagnosis
- Person’s health does not limit them from being active (self reported)

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. Furthermore, you have increased your aerobic activity since your diagnosis. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets or exceeds the guidelines. Well done for achieving this milestone!

Your aim now is to maintain your activity level and focus on getting the most out of your routine.
Message number: Message 9

Message for person who is meeting the guidelines, is not physically limited but has reduced their activity level since diagnosis.

Main issue:

- Person is meeting the aerobic physical activity guidelines.
- Person has reduced their activity level since diagnosis
- Person’s health does not limit them from being active (self reported)

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Women who maintain this level of physical activity have a higher rate of surviving breast cancer and experience better overall health compared to those who are less active*.

If manageable, you may like to consider increasing your physical activity levels even further. Returning to the level you maintained prior to your diagnosis will have additional health benefits*.

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737
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Message number: message 10

Message for person who is meeting the guidelines, has not changed their activity level since they were diagnosis and has reported being limited

Main issue:

- Person is meeting the aerobic physical activity guidelines.
- Person exercises the same amount now as before their diagnosis.
- Person may experience difficulty-increasing activity due to physical limitation.
- Person should be encouraged to maintain current level

Message:
Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. Furthermore, you have maintained your aerobic activity since your diagnosis. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Women who maintain or increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets or exceeds the guidelines. Well done for achieving this milestone!

Your aim now is to maintain your activity level and focus on getting the most out of your routine.

Message Number: Message 11

Message for person who is meeting the guidelines, and has increased their activity level since diagnosis, even though they report being somewhat limited physically.

Main issue:

- Person is meeting the aerobic physical activity guidelines.
- Person has increased participation in physical activity
- Person may have difficulty increasing physical activity further due to limitation. Maintenance should be encouraged. Progression can be about limiting reductions

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. Furthermore, you have increased your aerobic activity since your diagnosis. Exercising at this level with the physical limitations that you have experienced is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Women who maintain or increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets or exceeds the guidelines. Well done for achieving this milestone!

Your aim now is to maintain your activity level and focus on getting the most out of your routine.
Message number: Message 12

Message for person who is meeting the guidelines, has reduced their activity level since diagnosis and reported being physically limited

Main issue:

- Person is meeting the aerobic physical activity guidelines.
- Person has reduced their activity level since diagnosis
- Person’s health may be limiting them from participating in physical activity.
  Focus on sustaining current level

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. Exercising at this level with the physical limitations that you have experienced is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to maintain your activity level and focus on getting the most out of your routine. Women who maintain or increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets or exceeds the guidelines.

Message Number: Message 13

Message for person who is not meeting the guidelines and is not limited.

Main issue:

- Message for person who is not meeting the guidelines
- Person’s health does not limit them from being active (self reported)
• We do not know if there PA level has changed since diagnosis

**Message:**

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, this just means that you will experience more improvement with increased activity. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.

Message Number: Message 14

*Message for person who is not meeting the guidelines but has reported being physically limited.*

**Main issue:**

• *Message for person who is not meeting the guidelines*

• Person’s health may limit them from being active (self reported)

• We do not know if there PA level has changed since diagnosis

**Message:**

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, this just means that you will experience more improvement with increased activity. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!

Women who increase their activity levels after diagnosis have a higher rate of surviving breast cancer and experience better overall health when compared with those who decrease their activity levels*.

It is important to progress slowly and within your physical limits. This could mean shorter sessions or activity at a lighter intensity than that which is specified in the guidelines. Any increase in physical activity that is maintained is progress in the right direction.
Message Number: Message 15

Message for person who is meeting the guidelines and is not limited.

Main issue:

- Message for person who is meeting the guidelines
- Person’s health does not limit them from being active (self reported)
- We do not know if there PA level has changed since diagnosis

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to maintain your activity level and focus on getting the most out of your routine. Women who maintain this level of physical activity have a higher rate of surviving breast cancer and experience better overall health compared to those who are less active*.

Message Number: Message 16

Message for person who is meeting the guidelines but has reported being physically limited.

Main issue:

- Message for person who is meeting the guidelines
- Person’s health may limit them from being more active (self reported)
- We do not know if there PA level has changed since diagnosis

Message:
Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. Exercising at this level with the physical limitations that you have experienced is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to maintain your activity level and focus on getting the most out of your routine. Women who maintain this level of physical activity have a higher rate of surviving breast cancer and experience better overall health compared to those who are less active*.

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Message number: Message 17
Message for person who is not meeting the guidelines and has not changed their level of activity since diagnosis
Main issue:

• Person is not meeting the aerobic physical activity guidelines.
• Person has not reduced their activity level since diagnosis
• We do not know if the person is limited.

Message:

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, this just means that you will experience more improvement with increased activity. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.

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Message number: Message 18

Message for person who is not meeting the guidelines and but has increased their participation in activity since diagnosis

Main issue:

- Person is not meeting the aerobic physical activity guidelines.
- Person has increased their activity level since diagnosis
- We do not know if the person is limited.

Message:

Congratulations! You have increased your aerobic activity since your diagnosis with breast cancer. This is a great achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.

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Message number: Message 19

Message for person who is not meeting the guidelines and has reduced their participation in activity since diagnosis

Main issue:

- Person is not meeting the aerobic physical activity guidelines.
- Person has reduced their activity level since diagnosis
- We do not know if the person is limited.

Message:

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, there are lots of reasons why women become less active, especially after experiencing cancer. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!
Your aim is to increase your activity toward the recommended level. Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.

Message number: Message 20

Message for person who is meeting the guidelines and has not changed their level of activity since diagnosis

Main issue:

- Person is meeting the aerobic physical activity guidelines.
- Person has not reduced their activity level since diagnosis
- We do not know if the person is limited.

Message concepts

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. Furthermore, you have maintained your aerobic activity since your diagnosis. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to continue to maintain your activity level and focus on getting the most out of your routine. Women who maintain their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets or exceeds the guidelines. Well done for achieving this milestone!

Message number: Message 21

Message for person who is meeting the guidelines and has increased their participation in activity since diagnosis

Main issue:

- Person is meeting the aerobic physical activity guidelines.
• Person has increased their activity level since diagnosis
• We do not know if the person is limited.

Message concepts

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. Furthermore, you have increased your aerobic activity since your diagnosis. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets or exceeds the guidelines. Well done for achieving this milestone!

Your aim now is to maintain your activity level and focus on getting the most out of your routine.

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860

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Message number: Message 22

Message for person who is meeting the guidelines but has reduced their participation in activity since diagnosis

Main issue:

• Person is meeting the aerobic physical activity guidelines.
• Person has reduced their activity level since diagnosis
• We do not know if the person is limited.

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Women who maintain this level of physical activity have a higher rate of surviving breast cancer and experience better overall health compared to those who are less active*. 
If manageable, you may like to consider increasing your physical activity levels even further. Returning to the level you maintained prior to your diagnosis will have additional health benefits*.

Message number: Message 23

Message for person who is not meeting the guidelines

Main issue:

- Person is not meeting the aerobic physical activity guidelines.
- We do not know if this person has reduced their activity level since diagnosis
- We do not know if the person is limited.

Message:

Your aerobic activity is below the nationally recommended level for cancer survivors. But don’t be discouraged, there are lots of reasons why women become less active, especially after experiencing cancer. Over the next 3 months, we will help you to set goals and move toward becoming a healthier you!

Your aim is to increase your activity toward the recommended level. Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.

Message number: Message 24

Message for person who is meeting the guidelines

Main issue:

- Person is meeting the aerobic physical activity guidelines.
- We do not know if this person has reduced their activity level since diagnosis
• We do not know if the person is limited.

Message:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. This is a fantastic achievement. Over the next 3 months, we will help you to set goals and keep moving toward becoming a healthier you!

Your aim is to maintain your activity level and focus on getting the most out of your routine. Women who maintain this level of physical activity have a higher rate of surviving breast cancer and experience better overall health compared to those who are less active*.

Message number: Message 25

Default message if we do not know if individual is meeting the guidelines.

Message:

We haven’t received any information from you on your participation in aerobic activity. Take a moment to fill out the graphs yourself to see your results.

Over the next 3 months, we will help you set goals to meet the recommended guidelines and get the most out of your routine. Any increase in physical activity that is maintained is progress in the right direction.

Women who increase their activity level after diagnosis have a higher rate of surviving breast cancer and experience overall better health compared to those who reduce their activity level*. Health benefits rise even further when that level of activity meets the guidelines.


5. Your Resistance-Based Activity 
(F_resistance_performance1)

Location: Newsletter 1, Page 2

Message: How are you going? (resistance-message block)

Communication objective:

1. Provide feedback on participants aerobic physical activity behaviour
   a. Current levels compared the guidelines
2. Encourage physical activity plan appropriate for individual.

Message parameters

Type: Micro-tailoring (graph continuous physical activity scores)

   Macro-tailoring (meeting guidelines or not)

Length:

Origin: Q2 (section C)

Survivorship research (Hayes lit summary):

Feedback variables

<table>
<thead>
<tr>
<th>Meeting the upper limit guidelines</th>
<th>R_PA1.RES_Sess ≥ 3 AND (R_PA1.RES_Ex ≥ 10 AND R_PA1.RES_Rep ≥ 8) ELSE IF</th>
<th>Then message 1</th>
<th>Le 1_PA1.RES.Guid = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 sessions, 10 exercises, 8 reps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting the lower limit guidelines</td>
<td>ELSE IF R_PA1.RES_Sess ≥ 1 AND (R_PA1.RES_Ex ≥ 6 AND R_PA1.RES_Rep ≥ 6)</td>
<td>Then message 2</td>
<td>Le 1_PA1.RES.Guid = 2</td>
</tr>
<tr>
<td>1 session, 6 exercises, 6 reps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not meeting the guidelines</td>
<td>ELSE IF R_PA1.RES_Sess &lt; 1 AND (R_PA1.RES_Ex &lt; 6 AND R_PA1.RES_Rep &lt; 6)</td>
<td>Then message 3</td>
<td>Le 1_PA1.RES.Guid = 3</td>
</tr>
<tr>
<td>Default</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Graphs – 3 x column graph

**Sessions**
R_PA1.RES_Sess
Lower limit = 1
Upper limit = 3

**Exercises**
R_PA1.RES_Ex
Lower limit = 6
Upper limit = 10

**Repetitions**
R_PA1.RES_Rep
Lower limit = 6
Upper limit = 12

**Consistent:**
*Header: Your Resistance-Based Activity*

**GRAPH:**
*Header: Average Number of Sessions Per Week*
*Average Number of Exercises Per Week*
*Average Number of Repetitions Per Week*

*Character count: 132*
Message 1:

Main issue:

- Participant is meeting the upper limit guidelines.
- Praise individual and reinforce benefits
- Explain progress

Message 1:

Congratulations! Your participation in resistance training meets the nationally recommended level for cancer survivors. Over the next 3 months, we will help you stay on track with your resistance-training and encourage you to set new goals as your muscle strength increases.

Resistance-based training is one of the best things you can do for your body. It helps increase your strength, maintain a healthy weight and improve bone strength.

To get the most out of your training, it is important to consistently advance the intensity of your workout by challenging your muscles with heavier weights. Slow progress is best because it allows your body to adapt to challenges presented by the exercises.

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Message 2:

Main issue:

- Participant is meeting the lower limit guidelines.
- Praise individual and reinforce benefits
- Encourage progression towards upper limit.

Message 2:

Congratulations! Your participation in resistance training meets the nationally recommended level for de-conditioned cancer survivors. Over the next 3 months, we will help you stay on track with your resistance-training and encourage you to set new goals as your muscle strength increases.
Resistance-based training is one of the best things you can do for your body. It helps increase your strength, maintain a healthy weight and improve bone strength.

Your aim is to progress toward the guidelines of 3 sessions a week consisting of 10 exercises per session, working different muscle groups. Once you increase the number of sessions and exercises, start setting goals to increase the intensity of your workout as well.

Message 3:

Your participation in resistance training is below the nationally recommended level for cancer survivors. Over the next 3 months, we will encourage and support you to include resistance-based activities into your weekly routine.

Resistance-based training is one of the best things you can do for your body. It helps increase your strength, maintain a healthy weight and improve bone strength.

This week, aim to complete 1 session of resistance-training, exercising 5-6 different muscle groups. There are all different types of resistance-training you can do. Refer to the enclosed poster for some ideas to get you started.

Message 4:

Resistance-based training is one of the best things you can do for your body. It helps increase your strength, maintain a healthy weight and improve bone strength.

The graphs to the right display the number of sessions, exercises and repetitions of resistance-activities recommended for cancer survivors. If you have completed any resistance training in the last month, plot your scores on the graphs. This will help you keep track of your progress.

Over the next 3 months, we will encourage and support you to include resistance-based activities into your weekly routine. This week, aim to complete 1 session of resistance-training, exercising 5-6 different muscle groups.
6. Using Weights
- Use weight that keeps you at 8-12 repetitions.
- Increase the weight by no more than 5% each time you increase the intensity.
- Swelling, achiness and a feeling of heaviness in your muscles suggest that you are doing too much and trying to progress too fast. Slow down if this happens to you!

7. Are you sitting too much? (F_Sitting_performance1)

Origin:


Feedback variables:
Text: Micro tailoring

IF I_SIT1._wd_total ≤ 120 minutes AND I_SIT1._we_total ≤ 120 minutes then
message 1 (low sitting both days).

ELSE IF I_SIT1._wd_total = > 120 mins AND I_SIT1._we_total = ≤ 120 minutes then
message 2 (High sitting weekday, low sitting weekend)

ELSE IF I_SIT1._wd_total = ≤ 120 mins AND I_SIT1._we_total = > 120 minutes then
message 3 (Low sitting weekday, high sitting weekend)

ELSE IF I_SIT1._wd_total = > 120 mins AND I_SIT1._we_total = > 120 minutes then
message 4 (High sitting weekday, high sitting weekend)

ELSE

Main issue:
Sitting for prolonged periods of time has been associated with adverse health outcomes, independent of those attributable to a lack of physical activity.

Message concepts:
Pattern of activity is important

Encourage them to break up their sedentary time by doing light – moderate physical activities. E.g. stretching, going for a light – brisk walk.

**Heading: Are you sitting too much?**

**Message:**

There is new research to show that sitting for prolonged periods of time is associated with adverse health outcomes, independent of those attributed to a lack of physical activity*. Some research has even indicated that prolonged sitting is associated with increased risk of death from cancer in some women.

{If “total sitting time wkd” = ≤ 120 mins AND “total sitting time wke = ≤120 minutes THEN
Great news - your results indicate that you do not spend too much of your time sitting down.

ELSE IF “total sitting time wkd” = > 121 mins AND “total sitting time wke = ≤120 minutes THEN
Your results indicate that you need to spend less time sitting down. Try to break up your sitting time during the week.

ELSE IF If “total sitting time wkd” = ≤ 120 mins AND “total sitting time wke = >121 minutes THEN
Your results indicate that you need to spend less time sitting down. Try to break up your sitting time over the weekend.

ELSE IF If “total sitting time wkd” = > 121 mins AND “total sitting time wke = > 121 minutes THEN
Your results indicate that you need to spend less time sitting down. Try to break up your sitting time during the week and over the weekend.

ELSE
How many hours did you spend sitting on a typical day last week? ______

Aim to limit the amount you sit in your leisure time to 2 hours per day, and always stand up and move around after 30 minutes of uninterrupted sitting. A good way to do this is by doing some stretching or some light-moderate physical activity intermittently throughout the day. Even standing up for just a few minutes can be beneficial.


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character count approx.. 770
8. Why should you be active? (F_benefitsofactivity1)

Location: Newsletter 1, Page 3

Message: Why should you be active?

Communication objective:
- Provide overview of the benefits of physical activity.
- Reinforce positive outcome expectations
- Address misconceptions/negative outcome expectations
- Promote outcome expectations with function outcomes/most valued by participants

Message parameters
Tailoring type: generic + micro-tailoring
Length: (Maximum character count 1731– Minimum character count 1145)
Origin (data):
**Schmitz & Speck (2010). Risk and benefits of physical activity among survivors who have completed treatment. Women’s Health. 6, 221-238

Message characteristics
Tone: Persuasive

Feedback variables (all possible messages within the message set)

Section D-Questions 5b, 6b, 9b, 10b, 11b

Raw variables: R_Outcome_expectancy1.e ; R_Outcome_expectancy1.f ;R_Outcome_expectancy1.i ; R_Outcome_expectancy1.j ; R_Outcome_expectancy1.k

Heading: Why should you be active?

Message:

There is a growing body of evidence suggesting that participating in regular physical activity may reduce the risk of your cancer returning. One research study found that women who exercised after their diagnosis had a reduced risk of recurrence and death from breast cancer by up to half, when compared to women who were inactive after their diagnosis*.
Whilst it isn’t yet clear how much or how little exercise is needed to gain survival benefits, results from the Nurses Health Study* suggest that just 3 hours of moderate intensity activity per week is associated with increased survival.

Participating in regular physical activity can also help you feel good about yourself, improve your mood and combat several of the side effects associated with breast cancer and breast cancer treatments.

\[
\text{IF } R\_\text{Outcome\_expectancy1.e} \geq 2 \text{ OR } R\_\text{Outcome\_expectancy1.f} \geq 2 \text{ OR } R\_\text{Outcome\_expectancy1.i} \geq 2 \text{ OR } R\_\text{Outcome\_expectancy1.j} \geq 2 \text{ OR } R\_\text{Outcome\_expectancy1.k} \geq 2 \text{ THEN}
\]

For example, for you participating in regular physical activity can**:

- \{IF R\_Outcome\_expectancy1.e = \geq 2 \text{ THEN} \} Help you control your weight, especially if you also eat well. Performing resistance-training is particularly beneficial, because it increases your muscle mass and more muscle mass means that your body burns more calories when you are at rest.

- IF R\_Outcome\_expectancy1.f = \geq 2 \text{ THEN} Help you regain lost muscle and improve your strength.

- IF R\_Outcome\_expectancy1.i = \geq 2 \text{ THEN} Help you manage fatigue and feel more energetic.

- IF R\_Outcome\_expectancy1.j = \geq 2 \text{ THEN} Help you strengthen your bones and may also help prevent bone loss and osteoporosis in pre-menopausal women.

- IF R\_Outcome\_expectancy1.k = \geq 2 \text{ THEN} Be protective against lymphedema or lymphedema flare-ups.


**Schmitz & Speck (2010). Risk and benefits of physical activity among survivors who have completed treatment. Women’s Health. 6, 221-238

Character count longest is approx. 1400

9. Warning Signs to Stop Exercising (F_Beingactivesafely1)
Location: Newsletter 1, Page 3

Message: Being active safely

Communication objective:
Provided advice on how to warm up and cool down
Instruct de-conditioned patients to start slow
Instruct patients when to avoid certain activities

**Message concepts:**
Ethical responsibility to provide survivors with some advice re how to exercise safely.
Start slow and progress slowly
Warm up and cool down
Exercise to tolerance

**Message parameters**

**Length:** Maximum character count -2691- minimum character count = 1734
**Type:** Generic text + Micro-tailoring

**Feedback variable**
F_Beingactivesafely

**Section D (Q17a)**
IF R_behaviour_capability1.a = ≤3 OR IF R_behaviour_capability1.a = 6

**Section G (Q Q6a/b/c/d/e/f/g/i/k/q/r; Q8)**
If R_comorbidity1.s (lymphedema) = 2(yes)
IF R_comorbidity1.c = 2 OR R_comorbidity1.d = 2 OR R_comorbidity1.e = 2 OR R_comorbidity1.f = 2 OR R_comorbidity1.g = 2 OR R_comorbidity1.i = 2 OR R_comorbidity1.k = 2 OR R_comorbidity1.q = 2 OR R_comorbidity1.r = 2
If R_comorbidity1.a or R_comorbidity1.b = 2 (yes - arthritis, osteoporosis)
If R_fatigue1_a = ≥ 3 (somewhat-very much)

**Section B (Q3)**
R_type_treatment.Bca = 1 (hormone)

Generic
Avoid public facilities and swimming during periods of increased risk of infection

**********************************************************************

Message:

Warning Signs to Stop Exercising

The research evidence shows that engaging in physical activity is safe for cancer survivors. However, if you notice any of the following stop your exercise session immediately and seek medical advice.

- Chest pain or pressure
- Development of irregular pulse
- Recurring leg pain or cramps
- Bone, back or neck pain of recent origin
- Tenderness in a joint that worsens with activity
- Sudden shortness of breath, muscular weakness, or tiredness
- Dizziness, feeling disoriented or confused
- Known blood counts that are below normal
- Any other unusual sensation.

Characters: 560

10. Picking Suitable Activities For You
(F_Beingactivesafely1)

Message: (appears as a separate message on pg 4)

Picking Suitable Activities for You

The type of activity that is suitable for you will depend on a number of factors, including any side-effects of treatment and your current health and fitness level. In general, most activities that involve large muscle groups that are performed at a moderate intensity are suitable.

Based on information that you have supplied, we recommend following this advice in order to avoid injury:

- Warm-up and cool down for 5-10 minutes before and after exercising. IF
  R_behaviour_capability1.a = ≤3 OR IF R_behaviour_capability1.a = empty
  THEN This can include 5 minutes of easy walking or cycling and an additional
5 minutes of stretching (we have included some stretches you may like to try on
the on a separate sheet enclosed with this newsletter).

- If R_comorbidity1.s = 2 or R_comorbidity1.s = empty THEN Women
  with lymphedema should wear a well-fitting compression garment during
  resistance-training. If there is any swelling, cease exercise and seek professional
  advice.

- AND/OR IF “R_fatigue1_a = ≥ 3 or R_fatigue1_a = empty THEN.
  Exercising at a vigorous intensity may exacerbate fatigue rather than improve it.
  Light-moderate intensity exercise is more appropriate when fatigue is an issue.

- AND/OR IF R_comorbidity1.c = 2 OR R_comorbidity1.d = 2 OR
  R_comorbidity1.e = 2 OR R_comorbidity1.f = 2 OR R_comorbidity1.g = 2
  OR R_comorbidity1.i = 2 OR R_comorbidity1.k = 2 OR R_comorbidity1.q
  = 2 OR R_comorbidity1.r = 2 THEN If you would like to engage in more
  vigorous activity, build up to it over time and consult your GP or an exercise
  specialist beforehand.

- AND/OR IF R_comorbidity1.a = 2 OR R_comorbidity1.b = 2 OR
  R_type_treatment.Bca =1 THEN It may be best to avoid activities that
  involve a high level of contact, such as contact sports, if bone pain or weakness
  is an issue. Whilst weight bearing activities (i.e. any activity that works your
  bones and muscles, such as walking or weight training) can help to improve
  bone strength if pain occurs some non weight bearing activities (such as
  swimming or cycling) may be more appropriate.

- If you are feeling a bit off - don’t push yourself. Exercising at a high intensity
  can do you more harm than good when your immune system is low. If you are
  feeling sick or know that you are at an increased risk of infection, take it easy
  and avoid places and activities that increase your risk of infection (such as
  public gym facilities and swimming pools).

- Be patient and progress slowly

11. Your Action Plan (F_Actionplannin1)

Location: Newsletter 1, Page 4

Message: Action planning

Communication objective:
- Promote use of behaviour change techniques
- Provide tangible options for inclusion in action plan

Message parameters
Generic
Length: Character count 1423

Message characteristics
Tone: Persuasive
### Message concepts

**Action planning increases self-efficacy**

Goal setting and action plans are an important component of MM4L

**Feedback variables (same as for aerobic feedback section):**

<table>
<thead>
<tr>
<th>Not meeting the aerobic guidelines (upper threshold)</th>
<th>Not at all limited – a little limited</th>
<th>Same activity as before diagnosis</th>
<th>Example goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_PA1.AR.Guid_modvig = 1 AND R_diability1 = &lt; 3 AND R_PA.PD_AR_global = 1 THEN MESSAGE 1</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

“On Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the first 10 minutes”.

| Exercise more now | I_PA1.AR.Guid_modvig = 1 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 2 THEN MESSAGE 2 |

“On Monday and Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the first 10 minutes”.

| Exercise less now | I_PA1.AR.Guid_modvig = 1 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 3 THEN MESSAGE 3 |

“On Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the first 5 minutes”.

| Somewhat limited-completely limited | Same activity as before diagnosis | I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 1 THEN MESSAGE 4 |

“On Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the 5 minutes”.

| Exercise more now | I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 2 THEN MESSAGE 5 |

“On Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.

©
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<th>Meeting the aerobic guidelines (upper threshold)</th>
<th>Exercise less now</th>
<th>Exercise more now</th>
<th>Exercise less now</th>
<th>Exercise more now</th>
<th>Exercise less now</th>
<th>Exercise more now</th>
<th>Exercise less now</th>
<th>Exercise more now</th>
<th>ELSE IF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all limited – a little limited</td>
<td>$\text{le } \text{I_PA1_AR.Guid_modvig} = 1$ AND $\text{R_diability1} = = \geq 3$ AND $\text{R_PA_PD_AR_global} = 3$ THEN MESSAGE 6</td>
<td>$\text{le } \text{I_PA1_AR.Guid_modvig} = 2$ AND $\text{R_diability1} = &lt; 3$ AND $\text{R_PA_PD_AR_global} = 2$ THEN MESSAGE 7</td>
<td>$\text{le } \text{I_PA1_AR.Guid_modvig} = 2$ AND $\text{R_diability1} = &lt; 3$ AND $\text{R_PA_PD_AR_global} = 3$ THEN MESSAGE 9</td>
<td>$\text{le } \text{I_PA1_AR.Guid_modvig} = 2$ AND $\text{R_diability1} = \geq 3$ AND $\text{R_PA_PD_AR_global} = 2$ THEN MESSAGE 10</td>
<td>$\text{le } \text{I_PA1_AR.Guid_modvig} = 2$ AND $\text{R_diability1} = \geq 3$ AND $\text{R_PA_PD_AR_global} = 3$ THEN MESSAGE 11</td>
<td>$\text{le } \text{I_PA1_AR.Guid_modvig} = 2$ AND $\text{R_diability1} = \geq 3$ AND $\text{R_PA_PD_AR_global} = 3$ THEN MESSAGE 12</td>
<td>$\text{le } \text{I_PA1_AR.Guid_modvig} = 1$ AND $\text{R_diability1} = &lt; 3$ AND $\text{R_PA_PD_AR_global} = 4$ THEN MESSAGE 13</td>
<td>Not limited</td>
<td>No value</td>
</tr>
<tr>
<td>Same activity as before diagnosis</td>
<td>“On Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.</td>
<td>“I will increase the intensity of my work out in one session this week, so that I am working a little bit harder”.</td>
<td>“I will add 10 minutes of moderate intensity exercise to one of my usual sessions this week”.</td>
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<td>“I will add 10 minutes of moderate intensity exercise to one of my usual sessions this week”.</td>
<td>“On Monday and Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the first 10 minutes”.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited</td>
<td>No value</td>
<td>(I_{PA1}.AR.Guid_{modvig} = 1 ) AND (R_diability1 \geq 3) AND (R_PA.PD_AR_global = 4) THEN MESSAGE 14</td>
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<tr>
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<td>“On Monday and Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.</td>
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<tr>
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<td></td>
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<td>“I will increase the intensity of my work out in one session this week, so that I am working a little bit harder”.</td>
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<td>“I will add an extra 10 minutes of moderate intensity activity to one of my usual sessions this week”.</td>
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<tr>
<th>Not meeting the guidelines</th>
<th>No value</th>
<th>Same as before</th>
<th>(I_{PA1}.AR.Guid_{modvig} = 1) AND (R_diability1 = 6) AND (R_PA.PD_AR_global = 1) THEN Message 17</th>
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<td></td>
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<td>“On Monday and Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.</td>
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<table>
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<th>More now</th>
<th>(I_{PA1}.AR.Guid_{modvig} = 1) AND (R_diability1 = 6) AND (R_PA.PD_AR_global = 2) THEN message 18</th>
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<tbody>
<tr>
<td></td>
<td>“On Monday and Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 10 minutes”.</td>
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</table>

<table>
<thead>
<tr>
<th>Less now</th>
<th>(I_{PA1}.AR.Guid_{modvig} = 1) AND (R_diability1 = 6) AND (R_PA.PD_AR_global = 3) THEN message 19</th>
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<tbody>
<tr>
<td></td>
<td>“On Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 10 minutes”.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Meeting the guidelines</th>
<th>NO Value</th>
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<td>“On Monday and Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 10 minutes”.</td>
</tr>
<tr>
<td>Condition</td>
<td>Value 1</td>
<td>Value 2</td>
<td>Message</td>
</tr>
<tr>
<td>-----------</td>
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<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>More now</td>
<td>I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 2</td>
<td>10 minutes’’.</td>
<td>“I will add an extra 10 minutes of moderate intensity activity to one of my usual sessions this week”.</td>
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<tr>
<td>Less now</td>
<td>I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 3</td>
<td>10 minutes’’.</td>
<td>“I will add an extra 10 minutes of moderate intensity activity to one of my usual sessions this week”.</td>
</tr>
<tr>
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<td>No value</td>
<td></td>
</tr>
<tr>
<td>Meeting the guidelines</td>
<td>No Value</td>
<td>No value</td>
<td></td>
</tr>
<tr>
<td>ELSE</td>
<td>DEFAULT MESSAGE</td>
<td></td>
<td>“On Monday morning I will go for a 15 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.</td>
</tr>
</tbody>
</table>

**Message (pg 4)**

**Your Action Plan**

Goal setting is an important part of *Move More For Life*. It might not seem like much, but writing down a plan can be a powerful motivational tool and will help you keep on track.

*Be specific* - write down what, where and with who (if anyone) you are going to do the activity.

An example goal this week could be

I_PA1.AR.Guid_modvig = 1 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 1 THEN “On Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the first 10 minutes”. 

©
ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 2 THEN
“On Monday and Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the first 10 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 3 THEN
“On Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the first 10 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 1 THEN
“On Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 2 THEN
“On Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 3 THEN
“On Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 1 THEN
“I will increase the intensity of my work out in one session this week, so that I am working a little bit harder”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 2 THEN
“I will increase the intensity of my work out in one session this week, so that I am working a little bit harder”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 3 THEN
“I will add 10 minutes of moderate intensity exercise to one of my usual sessions this week”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 1 THEN
“I will add 10 minutes of moderate intensity exercise to one of my usual sessions this week”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 2 THEN
“I will add 10 minutes of moderate intensity exercise to one of my usual sessions this week”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 3 THEN
“I will add 10 minutes of moderate intensity exercise to one of my usual sessions this week”.

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 4 THEN
“On Monday and Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least the first 10 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 4 THEN
“On Monday and Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.

©
ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 4 THEN “I will increase the intensity of my work out in one session this week, so that I am working a little bit harder”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 4 THEN “I will add an extra 10 minutes of moderate intensity activity to one of my usual sessions this week”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 1 THEN “On Monday and Thursday morning I will go for a 10 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 2 THEN “On Monday and Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 10 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 3 THEN “On Thursday morning I will go for a 20 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 10 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 4 THEN “I will add an extra 10 minutes of moderate intensity activity to one of my usual sessions this week”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 3 THEN “I will add an extra 10 minutes of moderate intensity activity to one of my usual sessions this week”.

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = 6 AND R_PA.PD_AR_global = 1 THEN “On Monday and Thursday morning I will go for a 15 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND R_PA.PD_AR_global = 4 THEN “I will add an extra 10 minutes of moderate intensity activity to one of my usual sessions this week”.

ELSE “On Monday morning I will go for a 15 minute walk around my neighbourhood. I’ll walk at a moderate intensity for at least 5 minutes”.

In the next 2 weeks I am going to:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Character count: 446
**Top Tip (pg 4 right column)**

Use the activity planner included with this newsletter to write down your goals each week. Scheduling in physical activity is important. If you just try to squeeze exercise in, it might never happen.

******************************************************************************

Character count 283

**12. Good Luck! (F_closingmessage1)**

Good Luck! (pg 4 right column, separate box)

We hope you enjoyed reading your first Move More for Life newsletter. You will receive your next newsletter in 6 weeks. It will contain tips and advice from a leading expert in the field and feedback on your progress. Please make sure to fill out the update card we send out in a few weeks; we will use the information to provide you with the most relevant materials we can.

Till next time,

The *Move More For Life* team.

******************************************************************************

Character count (423)
Appendix 4.3: Message concept booklet – Newsletter 2
MOVE MORE FOR LIFE

Message concept booklet

Newsletter 2

NB: This booklet contains the tailored messages to be used in Newsletter 2.
1. Welcome message (F_introduction2)

Location: Newsletter 2, Page 1

Message: Introduction to N2

Communication objective:

1. Introduce N2 / describe purpose of this newsletter.
2. Thank participant for filling out update card / encourage participant to fill out update card
3. Provide an overview of the Newsletter

Message Parameters

Type: Micro-tailoring + generic
Length: Short
Origin: Based on “R_first.name” and “R_updatecard1”

Feedback variables:

If R_updatecard1 = 1 (did not fill out) then message 1
If R_updatecard1 = 2 (did fill out) then message 2

**********************************************************************

Message number: 1

Main concepts:

Encourage participant to fill out the next update card.
Without the update card we cannot provide participant with personalised advice.

Message number: 2

Main concepts: Thank participant for filling out update card.
Update cards allow us to provide feedback that is relevant to them

Tone: Non judgemental
Message

Dear “R_first.name”,

We hope you enjoyed reading the *Move More For Life* newsletter we sent last month, and that you felt inspired to be more active.

This newsletter has lots of new information. Read on to hear expert advice on getting motivated and learn some helpful tips on creating a supportive environment.

2. Your Aerobic Physical Activity
   *(F_Aerobic_performance2)*

**Location:** Newsletter 2, page 1

**Communication objective:**

1. Provide feedback on participants physical activity behavior
   a. Progress since baseline

**Message Parameters**

**Origin:**

Baseline PA (Section C, Q1).

Current PA (Update card 1, Q1).

**Feedback Variables**

*Aerobic message block – progress since baseline*

1. PA1.1update.change_sess
   1 = Increase in sessions
   2 = decrease in sessions
3 = sessions remain the same

I_PA1.1update.change_mins
1 = Increase in minutes
2 = decrease in minutes
3 = minutes remain the same

I_PA1.1update.AR.Guid_modvig
1 = not meeting the guidelines (at time of this newsletter)
2 = meeting the guidelines (at time of this newsletter)

I_PA1.AR.Guid_modvig
1 = not meeting the guidelines (at time of baseline assessment – time 1)
2 = meeting the guidelines (at time of baseline assessment – time 1)

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<th>Current minutes – past minutes &gt;0 (increased number of minutes)</th>
<th>Currently not meeting the guideline</th>
<th>Not meeting the guideline at time 1</th>
<th>Message 1</th>
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<tbody>
<tr>
<td>Currently meeting the guideline</td>
<td>Not meeting the guideline at time 1</td>
<td>Message 2</td>
<td></td>
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<td>Meeting the guideline at time 1</td>
<td>Message 3</td>
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<tr>
<th>Current minutes – past minutes &lt;0 (decreased number of minutes)</th>
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<th>Current minutes - past minutes = 0 (remained the same)</th>
<th>Currently meeting the guideline</th>
<th>Not meeting the guideline at time 1</th>
<th>Message 7</th>
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<td>Current minutes - past minutes &gt;0 (increased number of minutes)</td>
<td>Currently not meeting the guideline</td>
<td>Not meeting the guideline at time 1</td>
<td>Message 8 (same as message 4)</td>
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<td>Not meeting the guideline at time 1</td>
<td>Message 9 (same as message 6)</td>
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<td>Message 17</td>
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No update card received (default) | Baseline data missing | 32

**Graph 1 - Minutes (max value = 500)**

Column 1.
- I_PA1.AR.ST_Mod_Mins

Column 2
- I_PA1.1.update.AR.ST_Mod_Mins

Column 3
- Recommendation = 150 minutes (non-tailored)

**Graph 2 - Sessions (max value = 7)**

Column 1.
- I_PA1.AR.ST_Mod_Sessions

Column 2
- I_PA1.1.update.AR.ST_Mod_Sess

Column 3.
- Recommendation = 5 sessions (non-tailored)

**CONSISTENT:**

**HEADING:** Your Aerobic Activity

**Graph**

*Note: Time spent engaging in vigorous activity is multiplied by 2 to account for the additional benefits.*

Character count: 10

Graph 1 Header: Average Number of Minutes Per Week
Message number: 1

Main issue:

This person has increased the number of sessions and the number of minutes they participate in aerobic activity since the last Newsletter.

They are currently not meeting the aerobic guidelines and they were not meeting the guidelines at baseline.

Message concepts:

- Congratulate participant on making progress. It is great that they have increased the number of sessions and the minutes that they participate in physical activity.

- Encourage participant to keep up the good work and set goals to help them progress towards the guidelines.

- Draw attention that some activity is better than none and more is better.

Message:

Congratulations! You have increased your participation in aerobic physical activity. This is a great achievement. Any increase in physical activity is progress in the right direction.

You are on your way to meeting the guidelines. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

******************************************************************************

Character count 548

Message number: Message 2

Main issue:

This person has increased the number of sessions and the number of minutes they participate in aerobic activity since the last Newsletter.

They are currently meeting the guidelines – they were not meeting the guidelines at baseline.

Message concepts:
Congratulate participant for increasing activity to a level sufficient to meet the guidelines. Highlight achievement

Highlight importance of maintenance

Message:

Congratulations! You have increased your participation in aerobic physical activity. It is a fantastic accomplishment that you changed your routine to meet the guidelines!

Your aim is to continue your great progress and maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

**********************************************************************
Character count 623

Message number: message 3

Main issue:

This person was meeting the guidelines at baseline and they have increased the number of minutes and sessions even further.

Message concepts:

- Congratulate person on success. Highlight achievement.
- Highlight importance of maintenance.

Message:

Congratulations! You have increased your aerobic activity level to above and beyond the guidelines! This is a fantastic accomplishment. The more you do the more health benefits you will gain.

Your aim is to continue your great progress and maintain a level of activity sufficient to meet the guidelines. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week.

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Character count 623

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**Message number:** message 4

**Main issue:**

This person has increased the number of sessions per week but has decreased the number of overall minutes since N1.

This person is currently not meeting the guideline and was not meeting the guideline at baseline.

**Message concept:**

- Congratulate person on increasing number of sessions
- Encourage person to focus on duration of sessions and increase number of minutes.
- Encourage person to set goals that move them towards meeting the guidelines

**Message:**

Congratulations! You have increased the number of aerobic activity sessions you complete a week. This is fantastic progress.

You are well on your way to meeting the guidelines. This week, focus on increasing the duration of one or more of the sessions you are already doing. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

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Character count 602

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**Message number:** message 5

**Main issue:**

This person has increased the number of sessions per week but has decreased the number of overall minutes.

This person is currently not meeting the guideline but they were meeting the guidelines at baseline.

**Message concept:**

- Congratulate person on increasing number of sessions
• Encourage person to focus on duration of sessions and increase number of minutes. Highlight importance of maintenance.

• Reassure participant that they are doing well.

• Encourage person to set goals that move them towards meeting the guidelines

**Message:**

Congratulations! You have increased the number of aerobic activity sessions you complete a week.

Your number of overall minutes spent participating in aerobic activity has decreased, and therefore you are no longer meeting the guidelines. Do not worry, it is normal for activity levels to ebb and flow throughout the year. Just remember to action plan and keep doing as much as you can.

This week, focus on increasing the duration of one or more of the sessions you are already doing. Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week.

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**Character count 613**

**Message number:** message 6

**Main issue:**

This person has increased the number of sessions per week but has decreased the number of overall minutes.

They are currently meeting the guidelines – they were not meeting the guidelines at baseline.

**Message concept:**

• Congratulate person on increasing number of sessions and meeting the guidelines.

• Highlight success

• Highlight importance of maintenance. Encourage person to focus on duration of sessions and increase number of minutes.

**Message:**

Congratulations! You have increased the number of aerobic activity sessions you complete a week. It is a fantastic accomplishment that you changed your routine to meet the guidelines!

Your aim is to continue your great progress and maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

©
Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

Character count 643

Message number: message 7

Main issue:

This person has increased the number of sessions per week but has decreased the number of overall minutes.

They are still meeting the guidelines.

Message concept:

- Congratulate person on maintaining physical activity level sufficient to meet the guidelines.
- Participant has increased number of sessions but reduced minutes,
- Highlight success and importance of maintenance. Encourage individual to increase number of minutes.

Message:

Congratulations! You have maintained a level of aerobic activity that meets the guidelines. This is a fantastic accomplishment.

Your aim is to keep up your great work and keep maintaining this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

Character count 579

**********************************************************************
Message number: message 8 (same as message 4)

Main issue:

This person has increased the number of sessions per week and has not changed the overall number of minutes of activity.

They are not meeting the guidelines and were not meeting them at baseline

Message concept:

• Congratulate person on increasing number of sessions per week. Highlight success

• Encourage person to focus on increasing duration of sessions.

• Encourage participant to set goals that move them towards meeting the guideline.

Message:

Congratulations! You have increased the number of aerobic activity sessions you complete a week. This is fantastic progress.

You are well on your way to meeting the guidelines. This week, focus on increasing the duration of one or more of the sessions you are already doing. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

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Character count 601
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Message number: message 9 (same as message 6)

Main issue:

This person has increased the number of sessions per week and has not changed the overall number of minutes of activity.

They are now meeting the guidelines.

Message concept:
• Congratulate person on increasing number of sessions and meeting the guidelines

• Highlight importance of maintenance

Message:

Congratulations! You have increased the number of aerobic activity sessions you complete a week. It is a fantastic accomplishment that you changed your routine to meet the guidelines!

Your aim is to continue your great progress and maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

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Character count 641

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Message number: message 10 (same as message 7)

Main issue:

This person has increased the number of sessions per week and has not changed the overall number of minutes of activity.

This person is still meeting the guidelines.

Message concept:

• Congratulate person on increasing number of sessions and maintaining activity at a level sufficient to meet the guidelines.

• Highlight importance of maintenance

• Encourage participants to set goals.

Message:

Congratulations! You have increased the number of aerobic activity sessions you complete a week. This is fantastic progress.

Your aim is to continue your great progress and maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.
Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

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Character count 580

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**Message number:** message 11

**Main issue:**

This person has decreased the number of sessions per week but has increased the number of minutes.

This person is currently not meeting the guideline and was not meeting the guideline at time 1.

**Message concept:**

- Congratulate person on increasing number of minutes.
- Encourage person to increase number of sessions.
- Encourage participants to set goals.

**Message:**

Congratulations! You have increased the number of minutes you engage in aerobic activity a week. This is fantastic progress.

You are well on your way to meeting the guidelines. This week, focus on including another session into your routine. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

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Character count 568

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**Message number:** message 12

**Main issue:**
This person has decreased the number of sessions per week but has increased the number of minutes.

This person is currently not meeting the guideline and was meeting the guideline at time 1.

Message concept:

- Congratulate person on increasing number of minutes.
- Encourage person to increase number of sessions.
- Encourage participants to set goals.

Message:

Congratulations! You have increased the number of minutes you engage in aerobic activity a week.

Your number of aerobic activity sessions a week has decreased, and therefore you are no longer meeting the guidelines. Do not worry, it is normal for activity levels to ebb and flow throughout the year. Just remember to action plan and keep doing as much as you can.

This week, focus on including another session into your routine. Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

Character count 659

Main issue:

This person has decreased the number of sessions per week but has increased the number of minutes.

This person is currently meeting the guideline and was not meeting the guideline at time 1.

Message concept:

- Congratulate person on increasing number of minutes and exercising at a level sufficient to meet the guidelines.
- Highlight importance of maintenance and encourage action planning

Message:
Congratulations! You have increased the number of minutes you engage in aerobic activity a week. It is a fantastic accomplishment that you changed your routine to meet the guidelines!

Your aim is to continue your great progress and maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

Character count 643

Message number: message 14 (same as message 7)
Main issue:
This person has decreased the number of sessions per week but has increased the number of minutes.
This person is still meeting the guidelines

Message concept:
- Congratulate person on increasing number of minutes and maintaining exercise at a level sufficient to meet the guidelines
- Highlight importance of maintenance and encourage action planning

Message:
Congratulations! You have maintained a level of aerobic activity that meets the guidelines. This is a fantastic accomplishment.

Your aim is to keep up your great work and maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

Character count 579
Message number: message 15

Main issue:
This person has decreased the number of sessions per week and has decreased the number of minutes

Person is not meeting the guidelines and was not meeting the guidelines at time 1

Message concept:
- Encourage participant to increase number of minutes and sessions
- Encourage participant to come up with an action plan

Message:
Your participation in aerobic activity has decreased over the past month. Do not worry, it is normal for activity levels to ebb and flow throughout the year. Just remember to action plan and keep doing as much as you can.

This week, focus on including another session into your routine. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

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Character count 641
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Message number: message 16

Main issue:
This person has decreased the number of sessions per week and has decreased the number of minutes

Person is not meeting the guidelines anymore but they were at time 1

Message concept:
- Encourage participant to increase number of minutes and sessions
- Encourage participant to come up with an action plan
- Reassure participant
Message:

Your participation in aerobic activity has decreased over the past month. Do not worry, it is normal for activity levels to ebb and flow throughout the year. Just remember to action plan and keep doing as much as you can.

This week, focus on including another session into your routine. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

Character count 644

Message number: message 17

Main issue:

This person has decreased the number of sessions per week and has decreased the number of minutes

Person is currently meeting the guidelines and was meeting the guideline at time 1

Message concept:

• Congratulate participant on successfully maintaining activity at a level to meet the guidelines

• Highlight dose-response relationship – the more activity you do the better

• Highlight importance of maintenance

• Encourage participant to come up with an action plan

Message:

Congratulations! You have maintained a level of aerobic activity that meets the guidelines. This is a fantastic accomplishment.

Your aim is to keep up your great work and continue to maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

Character count 580
Message number: message 18

Main issue:
This person has decreased the number of sessions per week but the number of minutes remained the same.

Person is currently not meeting the guidelines and was not meeting the guidelines at time 1.

Message concept:
- Encourage person to increase number of minutes and sessions.
- Encourage participant to set an action plan.

Message:
Well done for maintaining the amount of time you engage in aerobic activity over a week. You’ve taken the first step towards a more active and healthy life.

This week, focus on including another session into your routine. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

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Character count 547
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Message number: message 19

Main issue:
This person has decreased the number of sessions per week but the number of minutes remained the same.

Person is currently not meeting the guidelines but was meeting the guidelines at time 1.

Message concept:
- Encourage person to increase number of sessions per week.
- Reassure participant that they are doing well
- Highlight importance of maintenance
- Encourage participant to set an action plan.
**Message:**

Well done for maintaining the amount of time you engage in aerobic activity over a week. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Your number of sessions decreased, and therefore you are no longer meeting the guidelines. Do not worry, it is normal for activity levels to ebb and flow throughout the year. Just remember to action plan and keep doing as much as you can.

This week, focus on including another session into your routine. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week.

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**Character count 747**

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**Message number:** message 20 (same as message 17)

**Main issue:**

This person has decreased the number of sessions per week but the number of minutes remained the same.

Person is currently meeting the guidelines and was meeting the guidelines at time 1.

**Message concept:**

- Encourage person to increase number of sessions per week.
- Reassure participant that they are doing well
- Highlight importance of maintenance
- Encourage participant to set an action plan.

**Message:**

Congratulations! You have maintained a level of aerobic activity that meets the guidelines. This is a fantastic accomplishment.

Your aim is to keep up your great work and continue to maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

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**Character count 580**

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Message number: message 21 (same as message 11)

Main issue:

This person has increased the number of minutes of activity per week but the number of sessions remains the same.

Person is currently not meeting the guidelines and was not meeting the guidelines at time 1.

Message concept:

- Congratulate person for increasing physical activity.
- Encourage them to increase number and duration of sessions.
- Encourage action planning

Message:

Congratulations! You have increased the number of minutes you engage in aerobic activity a week. This is fantastic progress.

You are well on your way to meeting the guidelines. This week, focus on increasing the duration of one or more of the sessions you are already doing. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

Character count 598

Message number: message 22 (same as message 3)

Main issue:

This person has increased the number of minutes of activity per week but the number of sessions remains the same.

Person is currently meeting the guideline, and was meeting the guideline at time 1.

Message concept:

- Congratulate person for increasing physical activity and maintaining activity at a level sufficient to meet the guidelines.
Highlight the importance of maintenance and encourage action planning.

Message:

Congratulations! You have increased your aerobic activity level to above and beyond the guidelines! This is a fantastic accomplishment. The more you do the more health benefits you will gain.

Your aim is to continue your great progress and maintain a level of activity that meets the guidelines. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

Message number: message 23

Main issue:

This person decreased the number of minutes of activity per week but the number of sessions has remained the same.

Person is currently not meeting the guidelines and was not meeting the guidelines at time 1.

Message concept:

- Encourage person to increase physical activity
- Encourage action planning

Message:

Well done for maintaining the number of aerobic activity sessions you complete a week. You’ve taken the first step towards a more active and healthy life and are well on your way to meeting the guidelines.

This week, focus on increasing the duration of one or more of the sessions you are already doing. Think about what you can achieve, schedule it in and aim to do the same amount or more next week. Then start planning again.

Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

Character count 579
Message number: message 24

Main issue:
This person decreased the number of minutes of activity per week but the number of sessions has remained the same.

Person is currently not meeting the guidelines but they were meeting the guidelines at time 1.

Message concept:
- Highlight the importance of maintenance.
- Encourage people to focus on duration of session.
- Encourage action planning

Message:
Well done for maintaining the number of aerobic activity sessions you complete a week. Your number of overall minutes spent participating in aerobic activity has decreased, and therefore you are no longer meeting the guidelines. Do not worry, it is normal for activity levels to ebb and flow throughout the year. Just remember to action plan and keep doing as much as you can.

This week, focus on increasing the duration of one or more of the sessions you are already doing. Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

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Character count 655
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Message number: message 25 (same as message 17, message 20)

Main issue:
This person decreased the number of minutes of activity per week but the number of sessions has remained the same.

Person is currently meeting the guidelines and they were meeting the guidelines at time 1.

Message concept:
- Congratulate participants on maintenance
- Highlight dose-response relationship
• Highlight the importance of maintenance.

• Encourage action planning

Message:

Congratulations! You have maintained a level of aerobic activity that meets the guidelines. This is a fantastic accomplishment.

Your aim is to keep up your great work and continue to maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

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Character count 580
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Message number: message 26

Main issue:

Person has not changed their activity level since diagnosis. Person is completing the same number of sessions and the same number of minutes.

Person is still not meeting the guidelines.

Message concept:

• Encourage participant to increase participation in physical activity

• Encourage action planning

Message:

Well done for maintaining the amount of time you engage in aerobic activity over a week. You’ve taken the first step towards a more active and healthy life.

This week, focus on including another session into your routine. Think about what you can achieve this week, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

**********************************************************************
Character count 545
**********************************************************************
Message number: message 27 (same as message 7 and 14)

Main issue:

Person has not changed their activity level since diagnosis. Person is completing the same number of sessions and the same number of minutes.

Person is still meeting the aerobic activity guidelines.

Message concept:

- Congratulate individual for maintaining activity level
- Highlight importance of maintenance
- Inform participant about dose response
- Encourage action planning

Message:

Congratulations! You have maintained a level of aerobic activity that meets the guidelines. This is a fantastic accomplishment.

Your aim is to keep up your great work and continue to maintain this level of activity. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.

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Character count 579
******************************************************************************

Message number: message 28

Main issue:

Person is not meeting the guidelines.

Baseline data is missing – can’t determine if person has increased/decreased PA since last assessment.

Message concept:

- Encourage individual to increase physical activity at a level sufficient to meet the guidelines
Message:

Your results show that your current aerobic activity level is below the national recommendation for cancer survivors. Don’t be discouraged, this just means that you stand to gain more health benefits by increasing your physical activity.

This week, focus on making a small change. Think about what you can achieve, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

Make sure to return the next update card in a few weeks’ time so we can see how you are going.

**********************************************************************

Character count 681

**********************************************************************

Message number: message 29

Main issue:

Person is meeting the guidelines.

Baseline data is missing – can’t determine if person has increased/decreased PA since last assessment.

Message concept:

- Congratulate individual for meeting the guideline
- Encourage maintenance

Message:

Congratulations! Your results show that your current aerobic activity meets the nationally recommended level for cancer survivors.

Your aim is to maintain a level of activity that meets the guidelines. Maintenance is important as the health benefits associated with physical activity cease once physical activity ceases.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

Make sure to return the next update card in a few weeks time so we can see how you are going.

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Character count 615

©
Message number: message 30

Main issue:

Person did not return update card.

Not meeting the guidelines at baseline

Message concepts:

• Encourage person to return the update card
• Remind person of recommendation

Message:

We haven’t received an update from you on your participation in aerobic activity. Take a moment to fill out the graphs yourself to see your results.

Have you increased your aerobic physical activity? This week, focus on making a small change. Think about what you can achieve, schedule it in and aim to do the same amount or more next week. Then start planning again.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. This is the recommended level to improve your health.

Make sure to return the next update card in a few weeks time so we can see how you are going.

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642

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Message number: message 31

Main issue:

Person did not return update card.

Person was meeting the guidelines at baseline

Message concepts:

• Encourage person to return the update card
• Remind person of recommendation
• Encourage maintenance
Message:
We haven’t received an update from you on your participation in aerobic activity. Take a moment to fill out the graphs yourself to see your results.
Are you still meeting the guidelines?
Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.
Make sure to return the next update card in a few weeks’ time so we can see how you are going.

542

Message number: message 32
Main issue:
Person did not return update card.
Baseline data is missing as well.
Message concepts:
- Encourage person to return the update card
- Remind person of recommendation

Message:
We haven’t received an update from you on your participation in aerobic activity. Take a moment to fill out the graphs yourself to see your results.
How are you going?
Think about what you have on this week and be sure to schedule physical activity into your plans. Remember, you want to do aerobic activity for at least 30 minutes at least 5 days of the week. The more you do the more health benefits you will gain.
Make sure to return the next update card in a few weeks’ time so we can see how you are going.

524
3. Your Resistance-Based Physical Activity
(F_resistance_performance2)

Location:  Newsletter 1, Page 2

Message: How are you going? (Resistance-message block)

Communication objective:

1. Provide feedback on participants resistance physical activity behaviour
   a. Current levels compared to last assessment

2. Encourage physical activity plan appropriate for individual.

Message parameters

Type: Macro-tailoring (meeting guidelines or not)

Length: Character count 1189-744

Origin: Baseline Questionnaire Q2 (section C)

Update card 1 Q2.

I_PA1.RES.Guid

(1) Meeting the upper-limit guidelines at baseline
(2) Meeting the lower limit guidelines at baseline
(3) Not meeting either guidelines at baseline

I_PA1.1update.RES.Guid

(1) Meeting the upper-limit guidelines at time of update card 1
(2) Meeting the lower limit guidelines at time of update card 1
(3) Not meeting either guidelines at time of update card 1
### Feedback variables

<table>
<thead>
<tr>
<th>Feedback Variables</th>
<th>Meeting the upper limit guideline at baseline</th>
<th>Meeting the upper limit guideline at time of update card 1</th>
<th>Message 1</th>
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<td>Meeting the lower limit guideline at time of update card 1</td>
<td>Message 2</td>
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<td>Not meeting the guideline at time of update card 1</td>
<td>Message 3</td>
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<tr>
<td>Not meeting the guideline at baseline</td>
<td>Meeting the upper limit guideline at time of update card 1</td>
<td>Message 4</td>
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<tr>
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<td>Message 16</td>
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</table>
Header: Your Resistance-Based Activity

GRAPH:
Header: Average Number of Sessions Per Week
Average Number of Exercises Per Week
Average Number of Repetitions Per Week

Message number: message 1

Main issue: This person has maintained a level of resistance training sufficient to meet the upper-limit guidelines

Message concepts:
- Congratulate person for high achievement
- Encourage maintenance

Message:
Well done! You have maintained a level of resistance-training that meets the guidelines. This is a fantastic achievement.

Your aim now is to maintain this level of resistance-training and focus on optimising your workout. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Make sure that you progress slowly and have rest days between sessions.

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Character count 456

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Message number: message 2

Main issue: This person started out meeting the upper limit guidelines and decreased their participation so that they are now meeting the lower limit guidelines.

Message concepts:
- Congratulate person for maintaining resistance training at a level associated with health benefits
- Encourage person to increase resistance training to upper limit level
**Message:**

Well done! You have maintained a level of resistance-training that is associated with significant health benefits. This is a great achievement.

Your aim now is to maintain regular resistance-training and focus on optimising your workout. Think about what you have on this week and make sure to schedule resistance training into your plans.

Remember, your ultimate goal is to complete 3 sessions of resistance-training per week, consisting of 10 exercises working different muscle groups. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Make sure that you progress slowly and have rest days between sessions.

Character count 765

************************************************************************************

**Message number:** message 3

**Main issue:** This person started out meeting the upper limit guidelines and decreased their participation to below the recommended level.

**Message concepts:**

- Encourage person to increase resistance training to lower limit level

**Message:**

Your participation in resistance training has decreased to below the recommended level. But don’t be discouraged, over the next month you can work towards meeting the guidelines again.

Your next step is to plan ahead and fit in as much as you can. Think about what you can achieve this week, schedule it in, and adjust your plan next week based on your progress. Remember, you are working towards completing 3 sessions of resistance-training per week, consisting of 10 exercises working different muscle groups. If this isn’t achievable within the month, focus on meeting the guidelines for de-conditioned survivors.

Make sure that you progress slowly and have rest days between sessions.

Character count 697

************************************************************************************

**Message number:** message 4

**Main issue:** This person started out meeting the lower limit guidelines and increased their participation to meet the upper limit guidelines.

**Message concepts:**
• Encourage person to maintain current level of resistance training
• Remind participant about the importance of progression

Message:

Well done! You have increased your participation in resistance training to a level that meets the guidelines for conditioned survivors. Congratulations, this is a fantastic achievement!

Your aim now is to maintain this level of resistance-training and focus on optimising your workout. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Make sure that you progress slowly and have rest days between sessions.

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Character count 522

*************************************************************************************

Message number: message 5

Main issue: This person has maintained their participation in resistance-training at a level sufficient to meet the lower level guidelines.

Message concepts:
• Encourage person to maintain current level of resistance training
• Encourage person to progress towards meeting the upper limit

Message:

Well done! You have maintained a level of resistance-training that is associated with significant health benefits for cancer survivors. This is a great achievement.

Your aim now is to maintain regular resistance-training and focus on optimising your workout. Your ultimate goal is to do 3 sessions of resistance-training per week, consisting of 10 exercises working different muscle groups. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Make sure that you progress slowly and have rest days between sessions.

*************************************************************************************

Character count 626

*************************************************************************************
Message number: message 6

Main issue: This person started out meeting the lower limit guidelines and decreased their participation to below the recommended level.

Message concepts:

- Encourage person to increase resistance training to lower limit level

Message:

Your participation in resistance training has decreased to below the recommended level. But don’t be discouraged, over the next month you can work towards meeting the guidelines again.

Think about what you can achieve this week, schedule it in, and adjust your plan next week based on your progress. Aim to meet the guidelines for de-conditioned survivors (i.e. 1-2 sessions per week, consisting of 6 or more exercises working different muscle groups) and focus on maintaining this level of resistance training. From there, work towards meeting the guidelines for conditioned survivors.

Remember to progress slowly and have rest days between sessions.

Character count 649

Message number: message 7

Main issue: This person has increased their participation in resistance-training, and they are now meeting the upper limit guidelines.

Message concepts:

- Encourage person to maintain current level of resistance training
- Remind participant about the importance of progression

Message:

Well done! You have increased your participation in resistance training to a level that meets the guidelines for conditioned survivors. Congratulations, this is a fantastic achievement!

Your aim now is to maintain this level of resistance-training and focus on optimising your workout. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Make sure that you progress slowly and have rest days between sessions.
Message number: message 8

Main issue: This person has increased their participation in resistance-training, and they are now meeting the lower limit guidelines.

Message concepts:

- Encourage person to maintain current level of resistance training and progress towards meeting the upper limit
- Remind participant about the importance of progression

Message:

Well done! You have increased your participation in resistance training to a level that meets the guidelines for de-conditioned survivors. Congratulations, this is a fantastic achievement!

Aim to continue to meet the guidelines for de-conditioned survivors (i.e. 1-2 sessions per week, consisting of 6 or more exercises working different muscle groups) and focus on maintaining this level of resistance training. From there, work towards meeting the guidelines for conditioned survivors.

As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise. Make sure that you progress slowly and have rest days between sessions.

Message number: message 9

Main issue: This person was not meeting the guidelines at baseline and is still not meeting the guidelines.

Message concepts:

- Encourage person to progress towards meeting lower limit guidelines.

Message:

Your participation in resistance training is below the nationally recommended level for cancer survivors. But do not worry, we are here to help you out. Many women report a lack of confidence in performing resistance-training or face other barriers such as a lack of equipment.
To help you overcome these barriers, we included some resistance-training exercises (sent out with newsletter 1) that are easy to follow. If you complete just 6 of these exercises once a week, you will be well on your way to meeting the guidelines.

Think about what you can achieve this week, schedule it in, and adjust your plan next week based on your progress.

************************************************************************************

Character count 641

**Message number:** message 10

**Main issue:** This person is meeting the upper limit guidelines

Baseline data is missing so we do not know if they have increased or decreased participation.

**Message concepts:**

- Congratulate person
- Encourage maintenance

**Message:**

Well done! You are engaging in resistance training at a level that meets the guidelines for conditioned survivors. Congratulations, this is a fantastic achievement!

Your aim now is to maintain this level of resistance-training and focus on optimising your workout. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Make sure that you progress slowly and have rest days between sessions.

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Character count 500

************************************************************************************

**Message number:** message 11

**Main issue:** This person is meeting the lower limit guidelines

Baseline data is missing so we do not know if they have increased or decreased participation.

**Message concepts:**
- Congratulate person
- Encourage maintenance

**Message:**

Well done! You are engaging in resistance training at a level that meets the guidelines for de-conditioned survivors. Congratulations, this is a fantastic achievement!

Aim to continue to meet the guidelines for de-conditioned survivors (i.e. 1-2 sessions per week, consisting of 6 or more exercises working different muscle groups) and focus on maintaining this level of resistance training. From there, work towards meeting the guidelines for conditioned survivors.

As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise. Make sure that you progress slowly and have rest days between sessions.

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Character count 703

************************************************************************************

**Message number:** message 12

**Main issue:** This person is not meeting the resistance-training guidelines

Baseline data is missing so we do not know if they have increased or decreased participation.

**Message concepts:**

- Encourage person to progress towards meeting lower limit guidelines.

**Message:**

Your participation in resistance training is below the nationally recommended level for cancer survivors. But do not worry, we are here to help you out. Many women report a lack of confidence in performing resistance-training or face other barriers such as a lack of equipment.

To help you overcome these barriers, we included some resistance-training exercises (sent out with newsletter 1) that are easy to follow. If you complete just 6 of these exercises once a week, you will be well on your way to meeting the guidelines.

Think about what you can achieve this week, schedule it in, and adjust your plan next week based on your progress.

**********************************************************************************

Character count 641
Message 13

Main issue: This person did not return the update card.
They were meeting the upper limit guidelines at baseline.

Message concepts:

• Encourage maintenance

Message:

How much resistance-training have you completed in the past month? Are you still meeting the guidelines for conditioned cancer survivors?

Your aim is to maintain a level of resistance-training that meets the guidelines and focus on optimising your workout. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Remember to return the update card in a few weeks so we can see how you are going.

*************************************************************************************
Character count 501
*************************************************************************************

Message 14

Main issue: This person did not return the update card.
They were meeting the lower limit guidelines at baseline.

Message concepts:

• Encourage maintenance and progression towards upper limit

Message:

How much resistance-training have you completed in the past month? Are you still meeting the guidelines for de-conditioned cancer survivors? Have you progressed towards meeting the guidelines for conditioned survivors?

Your aim is to maintain a level of resistance-training that meets the guidelines and focus on optimising your workout. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise. Make sure that you progress slowly and have rest days between sessions.

Remember to return the update card in a few weeks so we can see how you are going.

*************************************************************************************
Character count 655
*************************************************************************************
Message number: message 15

Main issue:
This person did not return update card.
The person was not meeting the guidelines at baseline

Message concepts:
Encourage person to return update card
Remind person of recommendation

Message:
How much resistance-training have you completed in the past month?

If you had trouble increasing your resistance-training – don’t be discouraged. This is quite common. To help you out, we included some resistance-training exercises (sent out with newsletter 1) that are easy to follow. If you complete just 6 of these exercises once a week, you will be well on your way to meeting the guidelines.

Think about what you can achieve this week, schedule it in, and adjust your plan next week based on your progress. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Make sure you return the update card in a few weeks time so we can see how you are going.

Message number: message 16

Main issue:
This person did not return update card.
This person did not report resistance-training level at baselines.

Message concepts:
Encourage person to return update card
Remind person of recommendation

Message:
How much resistance-training have you completed in the past 2 months? Are you meeting the guidelines?
If you had trouble increasing your resistance-training – don’t be discouraged. This is quite common. To help you out, we included some resistance-training exercises (sent out with newsletter 1) that are easy to follow. If you complete just 6 of these exercises once a week, you will be well on your way to meeting the guidelines.

Think about what you can achieve this week, schedule it in, and adjust your plan next week based on your progress. As your strength increases challenge your muscles by lifting slightly heavier weights (no more than a 5% increase) or completing an additional set of each exercise.

Make sure you return the update card in a few weeks time so we can see how you are going.

Sitting time message block (F_Sitting_performance2)

Location: Newsletter 2, Page 2

Message: Sitting time feedback

Communication objectives:

- Encourage individuals to think about pattern of activity throughout the day
- Encourage social comparison

Message parameters

Type: Generic text + tailored pie chart

Length: 1759

Origin: Update card 1 Q2 (sitting)

Else: Baseline data

Else Default based on Harrison and Lynch’s data.
**Feedback variables**

Graph continuous scores for intermediate variables in pie chart.

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<tr>
<td>I_PA1.1update.Mo_pie = Moderate aerobic activity</td>
</tr>
<tr>
<td>I_PA1.1update.Mi_pie = Mild aerobic activity</td>
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<td>I_PA1.1update.Res_pie = Resistance activity</td>
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<tr>
<td>I_PA1.1update.SIT_pie = Sedentary</td>
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</table>

*Baseline variables used if update card data not available.

* If data not available from either source default values given

**Pie chart key**

I_PA1.1update.ST_pie = Vigorous aerobic activity
I_PA1.1update.Mo_pie = Moderate aerobic activity
I_PA1.1update.Mi_pie = Mild aerobic activity
I_PA1.1update.Res_pie = Resistance activity
I_PA1.1update.SIT_pie = Sedentary

**Message concept:**

Objective data – using accelerometers
How much of your day do you spend being active?
Show pie chart of vigorous, moderate, mild, resistance training, and sitting time.
4. What are other breast cancer survivors doing?

A recent study* used an objective measure of physical activity (called an accelerometer) to look at the pattern of activity in Australian breast cancer survivors.

The results showed that on average, breast cancer survivors spend 66% of their waking hours sitting or lying down, 33% doing light intensity activities such as walking slowly or house work and only 1% of their time doing moderate to vigorous activities that are associated with health benefits.

This equates to about 9.3 hours of sitting and only 3.7 minutes of moderate-vigorous intensity activity per day.

This is somewhat different to the pattern of activity that is self-reported by Australian breast cancer survivors, indicating that some women may be over estimating either the duration or intensity of the activities they engage in.

Characters: 803

5. Your Daily Pattern of Activity

The graph below shows an estimate of your daily pattern of activity during waking hours. Thinking about your activity level in this way may help you to identify when you can be more active throughout the day.

Sitting for prolonged periods is a risk factor for poor health even if you do enough activity to meet the guidelines. Remember to get up and move around every 30 minutes.

For a more accurate estimate, we recommend you keep a diary and record when you are sitting and when you are engaging in other activities.


Character count 567

{Inset tailored pie chart}
6. Testimonial
Learning From Experience…

Location: Newsletter 2, Page 2

Message: Testimonial

Communication objectives:

- Increase feeling of self-efficacy
- Observational learning

Message parameters

Type: Tailored message blocks

Length: 1498-1024

Origin: task-self efficacy questionnaire items (pg 12, Q18).

Feedback variables

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ELSE IMAGE 3

- Pictures to be sourced by HEADJAM

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ELSE IF I_task_SE1.aerscale = 2 AND $I_{Age} = 3$ AND $I_{BMI1} = 2$ THEN Message 12
ELSE IF $I_{task\_SE1.aerscale} = 1$ THEN MESSAGE 3
ELSE IF $I_{task\_SE1.aerscale} = 2$ THEN MESSAGE 9
ELSE MESSAGE 3

**Message number:** message 1

**Main issue:**

Person has low confidence for engaging in moderate intensity aerobic activity.

Person is young and is not over weight

**Message:**

*Angela*

*Diagnosed with breast cancer at age 28*
When I was diagnosed with breast cancer it was a huge shock. I was young and there was no history of breast cancer in my family. At first I just focused on getting through my treatment. Once it was over, I tried to be positive and start putting my life back together. I had heard from a breast care nurse that becoming more active would help me have more energy and if I did it regularly enough it may even help prevent a recurrence. I wasn’t thrilled at the idea of exercising. I’ve never really been interested in sports or exercise and a part of me just wanted to do the things that I enjoyed. I knew I wouldn’t forgive myself though if I got cancer again and I hadn’t tried to do everything I could to stay well. I started off by asking a few friends to go walking with me. We would go for a walk along the beach and then have a coffee at a café afterwards. Gradually we walked (and talked) further and after a few months I realised that we were walking for 40 minutes and that it was one of my favourite parts of the week. Now I exercise daily. It doesn’t seem like a chore anymore. It has become a part of my life. I feel healthier and happier and I have confidence in my body again.

Message number: message 2

Main issue:

Person has low confidence for engaging in moderate intensity aerobic activity.

Person is young and is over weight

Message:

Kellie

Diagnosed with breast cancer at age 30

Before my diagnosis, I was never really interested in sports or exercise. I always found it really difficult to be motivated, and was never any good at sport anyway. Even when I was trying to lose weight, as soon as things would slow down I’d stop exercising and put the weight back on. I think being diagnosed with breast cancer really made me think more about the way I was living my life. After I finished my treatment a breast care nurse spoke to me about the benefits of exercise. She really
emphasised that even if I didn’t lose any weight, that being more active would still help with things like fatigue and would ultimately improve my chance of beating cancer. I started off by asking one of my friends to join me twice a week to go walking. This was good because it meant I had someone to answer to if I didn’t feel like going. We would walk for 20 minutes and then get a coffee together afterwards. Gradually we walked further and further, and after a few months I realised that we were walking for 40 minutes and that it was one of my favourite parts of the week. Now I’m hooked and I go for a walk every morning before work. It doesn’t seem like a chore anymore. Now it is something I do because I want to. It has become a part of my life. I feel a lot more confident about my health and I have even lost some weight!

Message number:  message 3

Main issue:
Person has low confidence for engaging in moderate intensity aerobic activity.

Person is middle-aged and a normal weight

Message:

Carolyn

Diagnosed with breast cancer at age 50

I was someone who had never been interested in exercise. I just couldn’t understand why some people wanted to sweat and carry on rather than relax with a good book! When I was diagnosed with breast cancer I was devastated. My daughter had just given birth to my first grandchild and I felt betrayed by my body. I didn’t feel old or unhealthy. I was determined to take control again and do everything I could to beat the disease. The breast care nurses at my treatment centre were really good. They spoke to me about the importance of exercise in recovering from cancer and encouraged me to change my lifestyle. Now I exercise almost daily. It was something I had to build up to. I started by going for a morning walk twice a week. After a while I started to feel like I could do even more exercise and I bought some exercise DVDs to do at home and started swimming some mornings. Now I have a range of things I like to do and I pick and choose depending on what I have
on. Exercise has become a part of my life. Now it is something I do because I want to. I’m feeling confident in my body again and I love that I can (almost) keep up with my grandchildren.

Message number: message 4

Main issue:
Person has low confidence for engaging in moderate intensity aerobic activity.
Person is middle-aged and over-weight.

Message:

Robin
Diagnosed with breast cancer at age 52

Before I was diagnosed with breast cancer, exercise wasn’t very high on my priority list. I was working full-time and helping to look after my grandchildren. I knew that I was carrying too much weight, but I wasn’t too worried and just tried to eat better. I felt too busy to exercise. After I finished my cancer treatment, one of the breast care nurses spoke to me about becoming more active. I was resistant at first, but I guess wanting the best chance at beating cancer made me really think about the way I was living my life. I realised that I needed to make exercise a priority. When I exercise now, I have a much greater understanding of the importance of keeping active and that helps to keep me motivated. I know that I am helping myself to stay healthy. Becoming more active wasn’t as difficult as I thought it would be. I started off by walking twice a week. After a while I found myself wanting to do more. Now I walk daily. I feel happier and stronger and I’ve even lost some weight!

Message number: message 5
Main issue:
Person has low confidence for engaging in moderate intensity aerobic activity.
Person is older-aged and normal weight

Message:

Carol
Diagnosed with breast cancer at age 65

When I was diagnosed with breast cancer 3 years ago I was shocked. I had just retired and my husband and I were planning to go on holidays. We had to postpone the trip so that I could have treatment. During treatment I was nauseous and very fatigued. It was a difficult time for both of us but we were lucky to have such supportive family and friends. My daughter did a fair bit of research on things I could do to improve my recovery. She told me that exercise was one of the most important things for me to do. I wasn’t someone who was interested in exercise but I was determined to get better. I spoke to the breast care nurse at my treatment centre and she gave me some advice on what to do. I started off very slowly. I would go for a short walk in the morning with my husband. Eventually, we were walking for longer and enjoying it so much that when we did go on our holiday together, we went on several nature walks and joined walking tours instead of taking the tour bus. It was fantastic! Now exercise is a big part of my life. It helps me have more energy and I feel fit and strong.

*******************************************************
Character count 1,148
*******************************************************

Message number: message 6

Main issue:
Person has low confidence for engaging in moderate intensity aerobic activity.
Person is older-aged and normal weight

Message:

Joan
Diagnosed with breast cancer at age 61
When I was diagnosed with breast cancer four years ago I was shocked and scared. I knew that I was carrying too much weight and that I had some minor health issues, but overall I felt healthy. I found it very hard to concentrate. I couldn’t stop wondering what caused me to get cancer. I was very worried that it would come back. After a while I spoke to my GP about my anxiety. She was really helpful and suggested I exercise. I’d never really been interested in exercising before but I was determined to do something to take control again. I started very slowly. I would go for a short walk in the morning and again in the evening. After a few weeks I noticed that my fitness was improving and I could walk for longer. Now I take opportunities to be active throughout the day as well. I walk to the shops when I need a few things and I always make sure I take the stairs! Now exercise is just a part of my life. I feel happier and fitter and each time I exercise and I have peace of mind that I am doing something good for myself.

Character count 1,024

Message number: message 7

Main issue:

Person has high confidence for engaging in moderate intensity aerobic activity.

Person is young and is not over weight

Message:

*Kylie*

*Diagnosed with breast cancer at age 31*
and I wasn’t motivated to exercise at all. I spoke to my oncologist about how I felt and he suggested that I make a date with some friends and make it more social. This really worked for me because if I didn’t feel like going I’d have to answer to someone. After a while, it became a usual part of my routine and I started looking forward to it every week and actually felt motivated to do more. Now I exercise daily. I have a range of things I like to do and I pick and choose depending on what I have on. Becoming more active has been very rewarding. I feel and look better and I have a lot more energy.

************************************************************************************

Character count 1,185

************************************************************************************

Message number: message 8

Main issue:

Person has high confidence for engaging in moderate intensity aerobic activity.

Person is young and is over-weight

**Lauren**

*Diagnosed with breast cancer at age 32*

When I was diagnosed with breast cancer 3 years ago it was a giant shock. I was young and there was no history of breast cancer in my family. I couldn’t stop thinking about why it had happened to me. To say the least, I was devastated. Even after I finished treatment, I found it difficult to move on. I was worried that the cancer would come back. I spoke to my GP and they suggested that I exercise. They told me that exercise would help me feel better and that if I do it regularly it would help protect me from getting cancer again. When I told my doctor that I wasn’t motivated to exercise they suggested that I start slow and by doing something fun. I was willing to give it a go. I asked one of my good friends to catch up with me for a walk. We enjoyed it so much we started doing it more regularly and having a coffee afterwards. Since then I have made a lot of positive changes in my life. Now I exercise almost daily and I’ve started to eat a lot better too. I have found that I am able to do more and more and I’m really enjoying feeling fit and strong. If anything good has come from having cancer it is that I now live a healthier and happier life and make the most out of each day.
Message number: message 9

Main issue:

Person has high confidence for engaging in moderate intensity aerobic activity.

Person is middle-aged and not over-weight

*Sandra*

*Diagnosed with breast cancer at age 45*

When my oncologist spoke to me about the importance of exercise I knew that I needed to make some changes. I had all the equipment, I knew what to do, and I knew that I felt better when I was active, but exercise always seemed to be the thing that dropped off the schedule... At the time I had children who needed to be driven to sports and music lessons, a demanding career, and a house to run. My oncologists stressed to me that if I wanted to stay healthy that I needed to make exercise a “non-optional part of my day”. That really resonated with me and I realised that if I waited until I had the time or motivation to exercise that it would never happen. So I used the strategies that work in the other parts of my life: put it in my diary, plan ahead and don’t make it an optional choice – its just like doing the grocery shopping, I can’t wait until I FEEL like doing it, I just need to go and do it. Now exercise is a daily part of my life. I plan the week out in advance to fit it in around my other commitments – so I might walk at the park while the kids have their music lessons or get up half an hour earlier and use the elliptical runner while I watch breakfast TV. It doesn’t seem like a chore anymore. Now it is something I do because I want to. I feel happier and fitter and each time I exercise I have peace of mind that I am doing something good for myself.

Message number: message 10

Main issue:

Person has high confidence for engaging in moderate intensity aerobic activity.

Person is middle-aged and over-weight
Karen

Diagnosed with breast cancer at age 51

When I was diagnosed with breast cancer 2 years ago I was devastated. I had just gotten back from an overseas trip with my husband and was looking forward to going back to work and spending time with my grandchildren. I tried to carry on as normal after I finished my treatment but I found it very difficult. Even doing little things made me so much more tired than before. I spoke to my oncologist about it and he suggested that I exercise. For me, exercise has always been one of those things that drops off my schedule. I would have periods where I would try and fit more in but eventually something would come up and I’d stop again. I knew that being overweight was a risk factor for getting cancer again and that being active would actually help protect me from the cancer coming back. Even if I didn’t lose any weight. This time I knew I had to try a different approach. My oncologist suggested that I make exercise a “non-optional part of my day”. That really resonated with me. Usually I wait to see if I have the time or if I feel like it.

So I started planning the week out in advance to make sure that I fit exercise in around my other commitments. I’d wake up half an hour earlier and go for a swim before work or on the weekend I’d plan something active to do with my grandchildren. After a while it just became a part of my life. I have so much more energy and I feel great knowing that I am doing something good for my body each day.

********************************************************************************
Character count 1,498
********************************************************************************

Message number: message 11

Main issue:

Person has high confidence for engaging in moderate intensity aerobic activity.

Person is older-aged and normal weight

Message:

Gail

Diagnosed with breast cancer at age 67

I was very distressed when I was diagnosed with breast cancer 2 years ago. I had friends who had gone through cancer.
treatments before and I was scared. I didn’t feel like I could cope with what they went through. When my
oncologist encouraged me to be as active as possible during my treatment I was surprised. Physical
activity really was the last thing on my mind. But I thought that it would give me something else to focus
on and so I tried to do as much as I could. Most days this wasn’t much but it was something. I felt like it
was making a difference so I kept trying to be active once I finished my treatment. It was difficult. I was
very fatigued and sometimes I just didn’t feel like doing anything. I felt a lot weaker and much frailer
than I ever had before. This was incredibly upsetting to me. My doctor helped me to find activities that I
could do and my friends and family supported me along the way. I feel very lucky that I had such a strong
support network. Now I make sure I do something active every day. It is much easier than I thought it
would be. I go swimming and walking quite often and I have even started to play a few games of bowls. I
feel fitter and stronger and I have so much more energy.

Character count 1,137

**************************************************************************************

Message number: message 12

Main issue:

Person has high confidence for engaging in moderate intensity aerobic activity.

Person is older-aged and over-weight

Message:

*Kay*

*Diagnosed with breast cancer at age 64*

When my oncologist spoke to me about the importance of
exercise I already knew that I needed to make some changes. I
was quite overweight and I knew that this put me at risk. The
main difficulty I had was finding the motivation. I was
suffering from fatigue and exercise was usually the last thing I
felt like doing. My oncologist was very helpful and suggested
that I make exercise “a non-optional part of my day” and treat it like I would any other medicine. He also
suggested that I start out by doing something small and gradually build up to doing more. This actually
worked really well for me. I made sure that I had time and that I actively committed to doing 10 minutes of
exercise everyday. After a few weeks, I found that I was enjoying it and I started to do extra things some
days and look for opportunities to be active. I would walk to the shops if I only needed a few things or I
would make sure I took the stairs if there was an option to. Now I exercise for at least 30 minutes every
day. I feel so much healthier and happier and I have noticed great changes in my body too.
7. Expert advice

Location: Newsletter 2, page 3

Message: Expert advice from KC

Communication objective:

1. Introduce concept of behaviour change and the usefulness of behaviour change skills.
2. Introduce key behaviour change techniques and important factors
3. Enhance self-efficacy
4. Enhance motivation

Message parameters

Type: Generic text + image of Kerry (Pictures available from the internet)
Length: character count 1603

Message:

Heading: Expert Advice

Professor Kerry Courneya is a leading expert in the field of physical activity and cancer recovery. Here is what he had to say when we asked him about how individuals could empower themselves to exercise.

Being motivated to exercise is a major challenge for anyone but it can be especially problematic for cancer survivors. The effects of cancer treatment, even years afterwards, can make exercise more difficult and this can impact on motivation as well.

One of the best things you can do to enhance your motivation and ensure physical activity becomes a lifelong habit is to practice using behaviour change techniques, such as setting goals. It might seem simple but it makes sense and it works. Even if you are already active and have been active for a long time, using behaviour change techniques can help you adjust your workout as you progress. In my experience, survivors have found the following tips most useful:

1. Develop an action plan and set specific goals. Setting goals enhances your intention to exercise and coming up with a plan helps you overcome the usual barriers.
2. Make an appointment with yourself to exercise. This is about making the time. You can’t wait until you have the time. You have to schedule exercise in.

3. Monitor your progress. Keep an exercise diary or record when you exercise on your calendar. This can be useful for adjusting your plan and it can also be very motivating.

8. Creating a Supportive Social Environment

Location: Newsletter 2, page 3

Message: Creating a supportive environment

Communication objectives

- Provide tailored information regarding key SCT constructs (social support) to help participants create a supportive social environment

Message Parameters

Type: Message blocks

Length: 1184-1810 character count

Origin:

Social support scale (Section E; Q7).

I_Social_support1_scale

Exercise preference (Section D; Q12)

R_Pref_exercise_partner

Feedback variables:

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<th>Alone</th>
<th>Message 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With other survivors</td>
<td>Message 2</td>
</tr>
<tr>
<td>High Social support</td>
<td>With friends</td>
<td>Message 3</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>With family</td>
<td>Message 4</td>
</tr>
<tr>
<td></td>
<td>With my partner</td>
<td>Message 5</td>
</tr>
<tr>
<td></td>
<td>No preference</td>
<td>Message 6</td>
</tr>
<tr>
<td></td>
<td>Empty</td>
<td>Message 6</td>
</tr>
<tr>
<td>ELSE</td>
<td>Alone</td>
<td>Message 7</td>
</tr>
<tr>
<td></td>
<td>With other survivors</td>
<td>Message 8</td>
</tr>
<tr>
<td></td>
<td>With friends</td>
<td>Message 9</td>
</tr>
<tr>
<td></td>
<td>With family</td>
<td>Message 10</td>
</tr>
<tr>
<td></td>
<td>With my partner</td>
<td>Message 11</td>
</tr>
<tr>
<td></td>
<td>No preference</td>
<td>Message 12</td>
</tr>
<tr>
<td></td>
<td>Empty</td>
<td>Message 12</td>
</tr>
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</table>

**Algorithms**

IF 1_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 1 THEN Message 1
IF 1_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 2 THEN Message 2
IF 1_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 3 THEN Message 3
IF 1_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 4 THEN Message 4
IF 1_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 5 THEN Message 5
IF 1_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 6 THEN Message 6
IF 1_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = empty THEN Message 6
IF 1_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 1 THEN Message 7
IF 1_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 2 THEN Message 8
IF 1_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 3 THEN Message 9
IF 1_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 4 THEN Message 10
IF 1_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 5 THEN Message 11
IF 1_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 6 THEN Message 12
IF 1_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = empty THEN Message 12
ELSE THEN Message 6

<table>
<thead>
<tr>
<th>Social support</th>
<th>Main issue / Message concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF Social support = low</td>
<td>Issue: Person has low social support</td>
</tr>
<tr>
<td></td>
<td>Concepts: Highlight that social support is more than just having an exercise partner. It is also about having people to encourage you and help keep you on track. Having people to provide practical support can be most important for some people.</td>
</tr>
<tr>
<td></td>
<td>Highlight strategies to increase social support</td>
</tr>
<tr>
<td></td>
<td>1. Share your physical activity plans with your family and friends</td>
</tr>
<tr>
<td></td>
<td>2. Speak to a health professional, such as your doctor or an exercise physiologist. They can help monitor your progress but they may also know about activity programs or education sessions in your area.</td>
</tr>
<tr>
<td></td>
<td><em>If prefer to exercise alone</em></td>
</tr>
<tr>
<td></td>
<td>- Think of 1 or 2 people in your immediate circle of family and friends who you could speak to about your plans</td>
</tr>
<tr>
<td></td>
<td><em>If you prefer to exercise with other survivors</em></td>
</tr>
<tr>
<td></td>
<td>- Look into joining an exercise group that meets regularly.</td>
</tr>
<tr>
<td></td>
<td>- Dragon’s Abreast are fantastic. YWCA Encore and the cancer council often run short programs for cancer survivors. These programs can be a great way to meet other survivors and form your own exercise group.</td>
</tr>
<tr>
<td></td>
<td>- Start asking around about what is available in your local area.</td>
</tr>
<tr>
<td></td>
<td><em>If you prefer to exercise with friends</em></td>
</tr>
<tr>
<td></td>
<td>- Think of 1 or 2 people in your immediate circle of friends who you could speak to about your plans</td>
</tr>
<tr>
<td></td>
<td>- Make a commitment within the next week to contact those people</td>
</tr>
</tbody>
</table>
and come up with a concrete plan to be active together. For example, agree to meet every Wednesday at 5pm to go for a 30 minute walk. Give it an honest try for a month and make modifications if necessary to continue on.

**If you prefer to exercise with family**

- Think about what activities you can do with your family.
- Share your plan with your family.
- Make a commitment over the next week to come up with a concrete plan to be active together. For example, plan to go for a walk after dinner every Monday night for 30 minutes. Give it an honest try for at least a month and make modifications if necessary to continue on.

**If you prefer to exercise with your partner**

- Share your plan with your partner.
- Come up with a list of activities you would like to do together.
- Make a commitment over the next week to come up with a concrete plan to be active together. For example, plan to go for a walk after dinner every night for 30 minutes. Give it an honest try for at least a month and make modifications if necessary to continue on.

**If No preference**

- Think of 1 or 2 people in your immediate circle of family and friends who you could speak to about your plans
- Make a commitment within the next week to contact those people and come up with a concrete plan to be active together. For example, agree to meet every Wednesday at 5pm to go for a 30 minute walk. Give it an honest try for a month and make modifications if necessary to continue on.

---

**ELSE IF**

<table>
<thead>
<tr>
<th>Social support = high</th>
</tr>
</thead>
</table>

**Issue: Person has high social support**

Concepts: Highlight that social support isn’t just about having an exercise partner. It is also about having practical support from the people around you and having people encourage you and keep you on track. It is great that they have such a high level of social support and they should
If you prefer to exercise alone

Share your physical activity plans with your family and friends.

If you prefer to exercise with other survivors

Suss out what programs are available in the local area. If there is something you want to try go for it.

If you prefer to exercise with friends

Think of 1 or 2 people in your immediate circle of friends.

Make a commitment within the next week to contact those people and come up with a concrete plan to be active together. For example, agree to meet every Wednesday at 5pm to go for a 30 minute walk. Give it an honest try for a month and make modifications if necessary to continue on.

If you prefer to exercise with family

Think about what activities you can do with your family. Share your plan with your family.

- Make a commitment over the next week to come up with a concrete plan to be active together. For example, plan to go for a walk after dinner every Monday night for 30 minutes. Give it an honest try for at least a month and make modifications if necessary to continue on.

If you prefer to exercise with your partner

- Share your plan with your partner.

- Come up with a list of activities you would like to do together.

- Make a commitment over the next week to come up with a concrete plan to be active together. For example, plan to go for a walk after dinner every night for 30 minutes. Give it an honest try for at least a month and make modifications if necessary to continue on.

If No preference
- Think of 1 or 2 people in your immediate circle of family and friends who you could speak to about your plans

Make a commitment within the next week to contact those people and come up with a concrete plan to be active together. For example, agree to meet every Wednesday at 5pm to go for a 30 minute walk. Give it an honest try for a month and make modifications if necessary to continue on.

Message 1:

Creating a Supportive Social Environment

Having support from the people around you is invaluable when you are trying to make changes to your lifestyle. In terms of physical activity, the most helpful support can be having someone to exercise with, but it can also be having someone to encourage you to exercise or provide you with more practical help (e.g. cooking dinner) to free up your time. Sometimes it is difficult to ask for support or you may be in the habit of putting your loved ones’ needs before your own. Here are a few things you can do to help create a more supportive environment for you and your family and friends:

• Think of 1 or 2 people in your immediate circle of family and friends and share your physical activity plan with them. If others know the goals that are important to you, they can offer support and help you monitor your progress.

• Talk to a health professional about your physical activity plan and needs. Your doctor may know of activity programs or education sessions in your area that may be beneficial. Even if you would prefer to exercise alone, talking to others about exercise can be very motivating and expand your support network.

Message 2:

Creating a Supportive Social Environment

Having support from the people around you is invaluable when you are trying to make changes to your lifestyle. In terms of physical activity, the most helpful support can be having someone to exercise with, but it can also be having someone to encourage you to exercise or provide you with more practical help (e.g. cooking dinner) to free up your time. Sometimes it is difficult to ask for support or you may be in the habit of putting your loved ones’ needs before your own. Here are a few things you can do to help create a more supportive environment for you and your family and friends:

• Make a commitment within the next week to find out what services are available in your local area. You can look online or ask your doctor or another health professional. Dragons Abreast (Ph: 1300
889 566), which offers a fun way to get fit with other breast cancer survivors through dragon boating, may be a good place to start looking. Alternatively, the Cancer Council (Ph: 13 11 20) and YWCA Encore (Ph: 1800 305 150) offer short-term programs for cancer survivors. These short programs can be a great way to meet other survivors in your area and form your own exercise group.

- Think of 1 or 2 people in your immediate circle of family and friends and share your physical activity plan with them. If others know the goals that are important to you, they can offer support and help you monitor your progress.

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Character count 1466
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Message 3:

Creating a Supportive Social Environment

Having support from the people around you is invaluable when you are trying to make changes to your lifestyle. In terms of physical activity, the most helpful support can be having someone to exercise with, but it can also be having someone to encourage you to exercise or provide you with more practical help (e.g. cooking dinner) to free up your time. Sometimes it is difficult to ask for support or you may be in the habit of putting your loved ones needs before your own. Here are a few things you can do to help create a more supportive environment for you and your family and friends:

- Think of 1 or 2 people in your immediate circle of friends and share your physical activity plan with them. If others know the goals that are important to you, they can offer support and help you monitor your progress.

- Make a commitment within the next week to contact those people and come up with a concrete plan to be active together. For example, agree to meet one evening a week to go for a 30 minute walk. Give it an honest try for a month and make modifications if necessary to continue.

- If you have trouble finding someone to exercise with, consider joining a group and meeting some new people. Dragons Abreast (Ph: 1300 889 566) may be a good place to start looking. Alternatively, the Cancer Council (Ph: 13 11 20) and YWCA Encore (Ph: 1800 305 150) offer short-term programs for cancer survivors. These programs can be a great way to meet other survivors in your area and form your own exercise group.

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Character count 1564
********************************************************************************************

Message 4:

Creating a Supportive Social Environment

Having support from the people around you is invaluable when you are trying to make changes to your lifestyle. In terms of physical activity, the most helpful support can be having someone to exercise with, but it can also be having someone to encourage you to exercise or provide you with more practical help (e.g. cooking dinner) to free up your time. Sometimes it is difficult to ask for support or you may be in the
habit of putting your loved ones needs before your own. Here are a few things you can do to help create a more supportive environment for you and your family and friends:

- Think about what activities you can do with your family and share your ideas and your personal goals with them. If others know the goals that are important to you, they have the opportunity to offer support.

- Make a commitment over the next week to come up with a concrete plan to be active together. For example, plan to go for a walk after dinner every night for 30 minutes. Give it an honest try for at least a month and make modifications if necessary to continue.

- If you are having trouble, think of 1 or 2 people in your circle of friends that you can talk to and share your plan with them. Talking to others will help create a stronger support network and they may be able to help you come up with some other strategies to be active with your family.

**Message 5:**

*Creating a Supportive Social Environment*

Having support from the people around you is invaluable when you are trying to make changes to your lifestyle. In terms of physical activity, the most helpful support can be having someone to exercise with, but it can also be having someone to encourage you to exercise or provide you with more practical help (e.g. cooking dinner) to free up your time. Sometimes it is difficult to ask for support or you may be in the habit of putting your loved ones needs before your own. Here are a few things you can do to help create a more supportive environment for you and your family and friends:

- Think about what activities you can do with your partner and share your ideas and your personal goals with them. If they know the goals that are important to you, they have the opportunity to offer support.

- Make a commitment over the next week to come up with a concrete plan to be active together. For example, plan to go for a walk after dinner every night for 30 minutes. Give it an honest try for at least a month and make modifications if necessary to continue.

- If you are having trouble, think of 1 or 2 people in your circle of friends that you can talk to and share your plan with them. Talking to others will help create a stronger support network and they may be able to help you come up with some other strategies.

**Message 6:**

*Creating a Supportive Social Environment*

Having support from the people around you is invaluable when you are trying to make changes to your lifestyle. In terms of physical activity, the most helpful support can be having someone to exercise with, but it can also be having someone to encourage you to exercise or provide you with more practical help.
Maintaining a Supportive Social Environment

Your results from the survey tell us that you have a good network of people supporting you to be active. This is fantastic; having this kind of support is invaluable when you are trying to maintain a healthy lifestyle.

Even though you are well supported, there are a few things worth considering to help you stay on track. For example, being supported isn’t just about whether or not you have an exercise partner, it is also about if you have people around you who encourage you to exercise and help you monitor your progress. Another important component is having someone provide you with more practical help (e.g. cooking dinner) to free up your time or show you certain skills (e.g. how to do resistance-training properly). Consider doing the following things if you haven’t done so already:

- Think of 1 or 2 people in your immediate circle of family and friends and share your physical activity plan with them. If others know the goals that are important to you, they can offer support and help you monitor your progress.
- Talk to a health professional about your physical activity plan and needs. Your doctor may know of activity programs or education sessions in your area that may be beneficial. Even if you would prefer to exercise alone, talking to others about exercise can be very motivating and expand your support network.

**********************************************************************
Character count 1572
**********************************************************************

Message 8
Maintaining a Supportive Social Environment

Your results from the survey tell us that you have a good network of people supporting you to be active. This is fantastic; having this kind of support is invaluable when you are trying to maintain a healthy lifestyle.

Even though you are well supported, there are a few things worth considering to would help you stay on track.

For example, being supported isn’t just about whether or not you have an exercise partner, it is also about if you have people around you who encourage you to exercise and help you monitor your progress. Another important component is having someone provide you with more practical help (e.g., cooking dinner) to free up your time or show you certain skills (e.g., how to do resistance-training properly).

Consider doing the following things if you haven’t done so already:

- Make a commitment within the next week to find out what services are available in your local area. You can look online or ask your doctor or another health professional. Dragons Abreast (Ph: 1300 889 566), which offers a fun way to get fit with other breast cancer survivors through dragon boating, may be a good place to start looking. Alternatively, the Cancer Council (Ph: 13 11 20) and YWCA Encore (Ph: 1800 305 150) offer short-term programs for cancer survivors. These programs can be a great way to meet other survivors in your area and form your own exercise group.

- Think of 1 or 2 people in your immediate circle of family and friends and share your physical activity plan with them. If others know the goals that are important to you, they can offer support and help you monitor your progress.
• Make a commitment within the next week to contact those people and come up with a concrete plan to be active together. For example, agree to meet every Wednesday night at 5pm to go for a 30 minute walk. Give it an honest try for a month and make modifications if necessary to continue.

Message 10

*Maintaining a Supportive Social Environment*

Your results from the survey tell us that you have a good network of people supporting you to be active. This is fantastic; having this kind of support is invaluable when you are trying to maintain a healthy lifestyle.

Even though you are well supported, there are a few things worth considering to would help you stay on track.

For example, being supported isn’t just about whether or not you have an exercise partner, it is also about if you have people around you who encourage you to exercise and help you monitor your progress. Another important component is having someone provide you with more practical help (e.g. cooking dinner) to free up your time or show you certain skills (e.g. how to do resistance-training properly). Consider doing the following things if you haven’t done so already:

• Think about what activities you can do with your family and share your ideas and your personal goals with them. If your family know the goals that are important to you, they have the opportunity to offer support.

• Make a commitment over the next week to come up with a concrete plan to be active together. For example, plan to go for a walk after dinner every night for 30 minutes. Give it an honest try for at least a month and make modifications if necessary to continue on.

Message 11

*Maintaining a Supportive Social Environment*

Your results from the survey tell us that you have a good network of people supporting you to be active. This is fantastic; having this kind of support is invaluable when you are trying to maintain a healthy lifestyle.

Even though you are well supported, there are a few things worth considering to would help you stay on track.

For example, being supported isn’t just about whether or not you have an exercise partner, it is also about if you have people around you who encourage you to exercise and help you monitor your progress. Another important component is having someone provide you with more practical help (e.g. cooking dinner) to free up your time or show you certain skills (e.g. how to do resistance-training properly). Consider doing the following things if you haven’t done so already:
• Think about what activities you can do with your partner and share your ideas and your personal goals with them. If they know the goals that are important to you, they have the opportunity to offer support.

• Make a commitment over the next week to come up with a concrete plan to be active together. For example, plan to go for a walk after dinner every night for 30 minutes. Give it an honest try for at least a month and make modifications if necessary to continue.

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Character count 1497
**********************************************************************

Message 12

Maintaining a Supportive Social Environment

Your results from the survey tell us that you have a good network of people supporting you to be active. This is fantastic; having this kind of support is invaluable when you are trying to maintain a healthy lifestyle.

Even though you are well supported, there are a few things worth considering to would help you stay on track.

For example, being supported isn’t just about whether or not you have an exercise partner, it is also about if you have people around you who encourage you to exercise and help you monitor your progress. Another important component is having someone provide you with more practical help (e.g. cooking dinner) to free up your time or show you certain skills (e.g. how to do resistance-training properly). Consider doing the following things if you haven’t done so already:

• Think of 1 or 2 people in your immediate circle of family and friends and share your physical activity plan with them. If others know the goals that are important to you, they can offer support and help you monitor your progress.

• Find out what services are available in your local area. You can look online or ask your doctor or another health professional. Dragons Abreast (Ph: 1300 889 566) may be a good place to start looking. Alternatively, the Cancer Council (Ph: 13 11 20) and YWCA Encore (Ph: 1800 305 150) offer short-term programs for cancer survivors. These programs can be a great way to meet other survivors in your area and form your own exercise group.

**********************************************************************
Character count 1810
**********************************************************************

9. Your Action Plan
Location: Newsletter 2, Page 4

Message: Action planning

Communication objective:

- Promote use of behaviour change techniques
- Provide feedback on goal setting behaviour

Message parameters
Tailoring type: Message blocks
Length:
Origin: Update card 1

Q3 – did you set a goal after newsletter 1?
No /Yes

Q4 – did you meet the goal you set?
No/Yes

Feedback variables

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If didn’t set goal</td>
<td>THEN MESSAGE 1</td>
</tr>
<tr>
<td>IF Set goal</td>
<td>AND IF Didn’t meet goal THEN MESSAGE 2</td>
</tr>
<tr>
<td></td>
<td>AND IF Met goal ELSE IF THEN MESSAGE 3</td>
</tr>
<tr>
<td>Did not return update card</td>
<td>THEN MESSAGE 4</td>
</tr>
</tbody>
</table>

Algorithms

IF R_updatecard1_setgoal = 1 Then Message 1
ELSE IF R_updatecard1_setgoal = 2 AND R_updatecard1_metgoal = 1 THEN Message 2

ELSE IF R_updatecard1_setgoal = 2 AND R_updatecard1_metgoal = 2 THEN Message 3

ELSE Message 4

**************************************************************************************
****
Message 1
Main issue: person did not set a goal

Message concept:

- Highlight usefulness of goal setting
- Encourage them to set a goal
- Encourage person to reflect. Did they set the goal to high or do they need to change a few things in order for the goal to be achievable.
- Encourage to set goal that is challenging but achievable.

Message:

Your Action Plan

As you know, goal setting is an important part of Move More For Life. It is a really useful motivational tool, and helps you to progress much faster and gain more health benefits from physical activity.

You may not feel like you need to set a goal, but we would like to encourage you to give it a go. Consider how you could improve your physical activity routine. It may be by participating in resistance training or it may be by reducing the amount of time you spend sitting down. We will leave it up to you. Just remember, whatever your plan is, make sure that it is specific, challenging and achievable.

Write your plan in the space below. Be specific, write down what, where and with who (if anyone) you are going to do the activity. Remember, you can use your activity planner to write down your goals, schedule in activity and monitor your progress.

Good luck, we are looking forward to seeing your progress over the next month!

The Move More For Life Team

In the next 2 weeks I am going to:

_____________________________________________________________________________________
_____________________________________________________________________________________
In the 2 weeks after I am going to:

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

Write down what changes you need to make to be able to meet your goal (e.g. I need to join the gym).

_____________________________________________________________________________________

_____________________________________________________________________________________

******************************************************************************
Character count = 2495
******************************************************************************

Message 2

Main issue: This person set a goal and did not meet the goal

Message concept:

- Praise for setting goal in first place.
- Encourage person to reflect. Did they set the goal too high or do they need to change a few things in order for the goal to be achievable.
- Encourage to set new goal that is challenging but achievable.

Message:

Your Action Plan

It is great to see that you took part in the goal setting activity in the last newsletter. As you know, this is an important part of Move More For Life. Well done for setting a goal, this is an important first step. Don’t worry that it wasn’t achieved; the important thing is that you think about the reasons why it was not reached. For example, did you set your goal too high or were there certain things that stood in your way?

The next step is to adjust your action plan to make it more achievable. You may decide to change your goal or you may decide that you need to change something else about your behaviour (e.g. getting up half an hour earlier) to be able to achieve your goal. We will leave it up to you. Just remember, whatever you plan is, make sure that it is specific, challenging and achievable.
Write your plan in the space below. Be specific, write down what, where and with who (if anyone) you are going to do the activity. Remember, you can use your activity planner to write down your goals, schedule in activity and monitor your progress.

Good luck, we are looking forward to seeing your progress over the next month!

The Move More For Life Team

In the next 2 weeks I am going to:

____________________________________________________________________________

In the 2 weeks after I am going to:

____________________________________________________________________________

Write down what changes you need to make to be able to meet your goal (e.g. I need to go to bed earlier so I can get up 20 minutes earlier).

____________________________________________________________________________

**********************************************************************
Character count 2394
**********************************************************************

Message 3

Main issue: This person set a goal and met the goal.

Message concept:

- Praise for setting goal and congratulations for meeting goal
- Reflect on if they should increase the goal or focus on maintaining the behaviour

Message:

Your Action Plan

It is great to see that you took part in the goal setting activity in the last newsletter. As you know this is an important part of Move More For Life. We would like to congratulate you for meeting your goal! Well done. This is fantastic progress.

Now that you have received some feedback and advice about how to change your behaviour, take some time to reflect on your goal and come up with a new plan. If you found your last goal easy to achieve, it may be a good idea to set a slightly more challenging goal this time. If you had difficulty achieving your goal last time, you may need to adjust the goal or change something else about your behaviour (e.g. getting up half an hour earlier) to be able to achieve your goal. We will leave it up to you. Just remember, whatever your plan is, make sure that it is specific, challenging and achievable.
Write your plan in the space below. Be specific, write down what, where and with who (if anyone) you are going to do the activity. Remember, you can use your activity planner to write down your goals, schedule in activity and monitor your progress.

Good luck, we are looking forward to seeing your progress over the next month!

The Move More For Life Team

In the next 2 weeks I am going to:

____________________________________________________________________________

In the 2 weeks after I am going to:

____________________________________________________________________________

Write down what changes you need to make to be able to meet your goal (e.g. I need to go to bed earlier so I can get up 20 minutes earlier).

**********************************************************************
Character count 2349
**********************************************************************

Message: 4

Main issue: person did not return update card/ did not answer question on update card

Message concept:

- Encourage them to answer all questions/ return update card
- Highlight usefulness of goal setting
- Encourage them to set a goal
- Encourage person to reflect. Did they set the goal too high or do they need to change a few things in order for the goal to be achievable.
- Encourage to goal that is challenging but achievable.

Message:

Your Action Plan

As you know, goal setting is an important part of Move More For Life. It is a really useful motivational tool, and helps you to progress much faster and gain more health benefits from physical activity.

We haven’t received any information from you about whether or not you set a goal. You may not feel like you need to set a goal, but we would like to encourage you to give it a go. Think about your physical activity over the past month and how much you would like to be doing. Set a goal and come up with a
Plan for how you will achieve it. We will leave the details up to you. Just remember, whatever you plan is, make sure that it is specific, challenging and achievable.

Write your plan in the space below. Be specific, write down what, where and with who (if anyone) you are going to do the activity. Remember, you can use your activity planner to write down your goals, schedule in activity and monitor your progress.

Good luck, we are looking forward to seeing your progress over the next month!

The Move More For Life Team

In the next 2 weeks I am going to:

____________________________________________________________________________

In the 2 weeks after I am going to:

____________________________________________________________________________

Write down what changes you need to make to be able to meet your goal (e.g. I need to go to bed earlier so I can get up 20 minutes earlier).

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Character count 2355
**********************************************************************

Good Luck! (F_closingmessage2)

Good Luck!

We hope you enjoyed reading your second Move More For Life newsletter. You will receive your final newsletter from us in 6 weeks. It will contain an overview of your progress over the last few months and an advice column from a leading exercise physiologist who specialises in oncology.

Once again, please make sure to fill out the update card we send out in a few weeks; we will use the information to provide you with the most relevant materials we can.

Good luck, we are looking forward to seeing your progress over the next month!

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Character count 535
**********************************************************************

10. The Activity Planner

We have followed Professor Courneya’s advice and provided you with an activity planner so that you easily plan for physical activity and track your progress.
Keep the activity planner somewhere you will see it every day (e.g. on the fridge) and fill it out as you go. Don’t underestimate the satisfaction of colouring in those smiley faces!

************************************************************************************

363

************************************************************************************
Message Concept Booklet

Newsletter 3
1. Welcome Message (F_Introduction3)

**Location:** Newsletter 3, page 1

**Message:** Introduction to newsletter 3

**Communication objective:**

- Introduce newsletter 3, describe purpose of the newsletter
- Provide an overview of the newsletter
- Highlight that this is the last newsletter that they will receive from us.
- Encourage adoption/maintenance

**Message Parameters**

*Type:* tailored message blocks + Micro-tailoring for first name

*Length:* 441-593 characters

*Origin:* Based on participants R_first.name and PA status at time 1

*Tone:* Encouraging

**Feedback variables**

I_PA1.2update.AR.Guid_modvig

I_PA1.1update.AR.Guid_modvig

I_PA1.ARGuid_modvig

- 1 not meeting the guidelines
- 2 meeting the guidelines

I_PA1.2update.RES.Guid

I_PA1.1update.RES.Guid

I_PA1.RES.Guid

- 1 Meeting the upper limit guidelines
- 2 Meeting the lower limit guidelines
• 3 Not meeting the guidelines

**Algorithms**

IF I_PA1.2update.AR.Guid_modvig = 2 OR IF I_PA1.2update.RES.Guid = 1 OR IF I_PA1.2update.RES.Guid = 2 OR

IF I_PA1.1update.AR.Guid_modvig = 2 OR IF I_PA1.1update.RES.Guid = 1 OR IF I_PA1.1update.RES.Guid = 2 OR

IF I_PA1.AR.Guid_modvig = 2 OR I_PA1.RES.Guid = 1 OR I_PA1.RES.Guid = 2 THEN 1

(Praise commitment; encourage maintenance)

ELSE IF I_PA1.2update.AR.Guid_modvig = 1 OR IF I_PA1.2update.RES.Guid = 3 OR IF I_PA1.1update.AR.Guid_modvig = 1 OR IF I_PA1.1update.RES.Guid = 3 OR IF I_PA1.AR.Guid_modvig = 1 OR I_PA1.RES.Guid = 3 THEN 2

(Praise commitment; encourage adoption)

ELSE THEN 3

**********************************************************************

**Message 1:**

Dear “R_first.name”

Congratulations on your participation over the past three months, it has been great to see your ongoing commitment and interest in being physically active.

We hope you enjoy this final newsletter. Read on to discover helpful tips, advice and support on staying active.

**********************************************************************

**2. Expert Advice (F_expertadvice3)**

**Location:** Newsletter 3, page 1

**Message:** Expert advice – exercise progression

**Communication objectives:**

• Reinforce benefits and importance of cancer recovery and cancer rehabilitation.
Highlight the importance of progression i.e. to improve fitness and strength

Highlight importance of slow progression i.e avoid injury

Message parameters

Type: Generic text
Length: 3315
Origin: Exercise guidelines for cancer survivors

Message:

Dr Sandi Hayes is a National Breast Cancer Foundation Senior Research Fellow within the school of Public Health at the Queensland University of Technology, and is also an experienced Exercise Physiologist. Here is what she had to say when we asked her about exercising after breast cancer treatment.

What are the benefits of exercise?
There is good evidence that regular exercise improves the quality of life of breast cancer survivors, regardless of how long ago or little ago they had treatment. Some of the benefits that impact on improved quality of life include increases in functioning and range of motion, improvements in body composition and immune function and reductions in stress, anxiety and depression. There is also emerging evidence linking regular exercise after treatment with improved survival. The most recent estimates suggest that women who are active have a reduced risk of recurrence and dying from breast cancer by up to half, compared to those who are sedentary. Changes in activity level after diagnosis also may have an impact on survival, with reductions in activity associated with a four-fold increase in the risk of dying from breast cancer.

How much exercise is enough to obtain survival benefits?
There is still a lot unknown about the optimum exercise prescription to gain survival benefits. We do know that the benefits of exercise occur in a dose-response pattern, meaning that as exercise increases (or decreases) so do the potential benefits. The exercise guidelines for cancer survivors are based on our current knowledge about how much exercise is enough to gain most of the benefits associated with physical activity. Doing more activity may result in more benefits, but the upper threshold for where benefits cease to occur is unknown. The most recent study investigating exercise and survival found that exercising for 3 hours a week at a moderate intensity was associated with increased survival. An important thing to note is that to obtain benefits from exercise, exercise needs to be undertaken regularly and maintained over the long-term.

Are most breast cancer survivors active?
We know from the research evidence that most breast cancer survivors in Australia do not engage in aerobic activity at a level sufficient to meet the guidelines and that very few do any resistance training. The good news is that over the last decade there has been a considerable amount of research conducted to try and improve the services available to breast cancer survivors and there are now much more options available to those wishing to get active.

How and when should I progress?
As your get fitter and stronger, your exercise routine will get easier. Adapting your program as your stamina and strength increases (known as progression) is important to get the most out of your routine.
You can adapt your program by changing how often you exercise, the length of time that you exercise, or by adding some intervals of harder work to your program. Make sure that you progress slowly and don’t try and change too much at once. Slow progress is best because it allows your body to adapt to the challenges presented by the exercises.

3. Your Aerobic Activity (F_Aerobic_performance3)

Location: Newsletter 3, page 2

Message: How are you going?

Communication objective:

- Provide feedback on progress over the last three months
  - Highlight change in activity levels since baseline
- Praise/Encourage regular aerobic PA over time (maintenance)

Message Parameters

Type: Micro-tailored

Length: 404-1,271

Origin: Update card 2, Baseline Survey

Text

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<tr>
<th>I_PA1.2update_baseline.change = 1</th>
<th>Increased activity by 20 minutes since baseline</th>
<th>Not Meeting the guidelines at update card 2</th>
<th>Message 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Meeting the guidelines at update card 2</td>
<td>Message 2</td>
</tr>
<tr>
<td>I_PA1.2update_baseline.change = 2</td>
<td>Decreased activity by 20 minutes since baseline</td>
<td>Not Meeting the guidelines at update card 2</td>
<td>Message 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meeting the guidelines at update card 2</td>
<td>Message 4</td>
</tr>
<tr>
<td>Scenario</td>
<td>Outcome</td>
<td>Message</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>I_PA1.2update_baseline.change = 3</td>
<td>Not Meeting the guidelines at update card 2</td>
<td>Message 5</td>
<td></td>
</tr>
<tr>
<td>Not changes activity level by 20 minutes since baseline</td>
<td>Meeting the guidelines at update card 2</td>
<td>Message 6</td>
<td></td>
</tr>
<tr>
<td><strong>Update card 2 not returned</strong></td>
<td>Not Meeting the guidelines at update card 1</td>
<td>Message 7</td>
<td></td>
</tr>
<tr>
<td>I_PA1.1update.change_mins = 1</td>
<td>Meeting the guidelines at update card 1</td>
<td>Message 8</td>
<td></td>
</tr>
<tr>
<td>Increased activity level at time of update card 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>I_PA1.1update.change_mins = 2</strong></td>
<td>Not Meeting the guidelines at update card 1</td>
<td>Message 9</td>
<td></td>
</tr>
<tr>
<td>Decreased activity level at time of update card 1</td>
<td>Meeting the guidelines at update card 1</td>
<td>Message 10</td>
<td></td>
</tr>
<tr>
<td><strong>I_PA1.1update.change_mins = 3</strong></td>
<td>Not Meeting the guidelines at update card 1</td>
<td>Message 11</td>
<td></td>
</tr>
<tr>
<td>Activity level remained the same at time of update card 1</td>
<td>Meeting the guidelines at update card 1</td>
<td>Message 12</td>
<td></td>
</tr>
<tr>
<td><strong>No update cards returned</strong></td>
<td>Not Meeting the guidelines at baseline</td>
<td>Message 13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meeting the guidelines at baseline</td>
<td>Message 14</td>
<td></td>
</tr>
<tr>
<td><strong>Else</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Algorithms

IF I_PA1.2update_baseline.change = 1 AND IF I_PA1.2update.AR.Guid_modvig = 1 THEN
MESSAGE 1 (MICROT: “I_PA1.2update_baseline.change_ mins”

ELSE IF I_PA1.2update_baseline.change = 1 AND IF I_PA1.2update.AR.Guid_modvig = 2 THEN
MESSAGE 2 (MICROT: “I_PA1.2update_baseline.change_ mins”

ELSE IF I_PA1.2update_baseline.change = 2 AND IF I_PA1.2update.AR.Guid_modvig = 1 THEN
MESSAGE 3 (MICROT: “I_PA1.2update_baseline.change_ mins”

ELSE IF I_PA1.2update_baseline.change = 2 AND IF I_PA1.2update.AR.Guid_modvig = 2 THEN
MESSAGE 4 (MICROT: “I_PA1.2update_baseline.change_ mins”

ELSE IF I_PA1.2update_baseline.change = 3 AND IF I_PA1.2update.AR.Guid_modvig = 1 THEN
MESSAGE 5

ELSE IF I_PA1.2update_baseline.change = 3 AND IF I_PA1.2update.AR.Guid_modvig = 2 THEN
MESSAGE 6

ELSE IF I_PA1.1update.change_mins = 1 AND I_PA1.1update.AR.Guid_modvig = 1 THEN
MESSAGE 7 (MICROT: “I_PA1.1update_baseline.change_ mins”

ELSE IF I_PA1.1update.change_mins = 1 AND I_PA1.1update.AR.Guid_modvig = 2 THEN
MESSAGE 8 (MICROT: “I_PA1.1update_baseline.change_ mins”

ELSE IF I_PA1.1update.change_mins = 2 AND I_PA1.1update.AR.Guid_modvig = 1 THEN
MESSAGE 9 (MICROT: “I_PA1.1update_baseline.change_ mins”

ELSE IF I_PA1.1update.change_mins = 2 AND I_PA1.1update.AR.Guid_modvig = 2 THEN
MESSAGE 10 (MICROT: “I_PA1.1update_baseline.change_ mins”

ELSE IF I_PA1.1update.change_mins = 3 AND I_PA1.1update.AR.Guid_modvig = 1 THEN
MESSAGE 11

ELSE IF I_PA1.1update.change_mins = 3 AND I_PA1.1update.AR.Guid_modvig = 2 THEN
MESSAGE 12

ELSE IF I_PA1.AR.Guid_modvig = 1 THEN MESSAGE 13

ELSE IF I_PA1.AR.Guid_modvig = 2 THEN MESSAGE 14

ELSE THEN MESSAGE 15

CONSISTENT:

HEADING: Your Aerobic Activity

Graph

Note: Time spent engaging in vigorous activity is multiplied by 2 to account for the additional benefits.

Character count: 106
Graph 1 Header: Average Number of Minutes Per Week

Graph 2 Header: Average Number of Sessions Per Week

Message 1:

Congratulations! You have increased your aerobic activity since the first assessment! This is a fantastic result.

In the coming months aim to keep up your great progress and strive toward meeting the recommended guidelines. As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 343

Message 2:

Congratulations! You have increased your aerobic activity since the first assessment! This is a fantastic result.

You are exercising at a level that has fantastic health benefits and meets the recommended guidelines for cancer survivors. In the coming months aim to keep up your great work and strive to maintain this level of activity. As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 459

Message 3:

You have decreased your aerobic activity by since the first assessment. There are lots of reasons why this might be the case. The main thing is that you keep aiming to do as much activity as you can.

Aim to build up your activity level again. If things have changed, adapt your routine to suit your current circumstances. You will be back on track in no time at all. As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 486

Message 4:

Congratulations! Your aerobic activity meets the nationally recommended level for cancer survivors. This is a fantastic result.

Although you have decreased your aerobic activity since the first assessment, you are exercising at a level that has fantastic health benefits and meets the recommended guidelines for cancer survivors. In the coming months aim to keep up your great work and strive to maintain this level of activity. As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 550
Message 5:

Your participation in aerobic activity has not changed substantially since the first assessment. There are lots of reasons why this might be the case. Changing your behaviour can be difficult and it may take a few attempts before you are able to enjoy physical activity as a regular part of your life. The main thing is that you keep aiming to do as much as you can.

Even just a small increase in activity will have substantial health benefits. Over the next week, focus on doing an extra 20-30 minutes of activity. Pay attention to how you feel afterwards; it may help motivate you to do an additional 20-30 minutes the next week.

**********************************************************************
Character count: 651
**********************************************************************

Message 6:

Congratulations! You are exercising at a level that has fantastic health benefits and meets the recommended guidelines, and have maintained this level for the past three months. This is a fantastic result!

It is great to see that aerobic activity is a regular part of your life. Keep doing what you are doing. If you are interested in pushing further and would like to increase your fitness and strength, consider adding some intervals of harder work to your program. Adapting your program as you get fitter and stronger will help you get the most out of your routine.

**********************************************************************
Character count: 568
**********************************************************************

Message 7:

We haven’t received an update from you on your participation in aerobic activity. To see your progress, fill out the graphs to the right.

In the last update we received, you increased your aerobic since the first assessment and were making great progress toward meeting the guidelines. We hope you are still moving forward.

In the coming months strive toward meeting the recommended guidelines for cancer survivors. As your body gets stronger and fitter, you’ll only feel better and better.

**********************************************************************
Character count: 549
**********************************************************************

Message 8:

We haven’t received an update from you on your participation in aerobic activity. To see your progress, fill out the graphs to the right.

In the last update we received, you increased your aerobic activity since the first assessment and were meeting the guidelines. We hope you are still on the right track.

In the coming months aim to maintain a level of activity that meets the recommended guidelines for cancer survivors. As your body gets stronger and fitter, you’ll only feel better and better.

**********************************************************************
Character count: 540
**********************************************************************
Message 9:

We haven’t received an update from you on your participation in aerobic activity. To see your progress, fill out the graphs to the right.

In the last update we received, you decreased your aerobic activity since the first assessment. How did you go this month? Were you able to increase your activity level?

If you haven't done so already, aim to build up your activity level again. If things have changed, adapt your routine to suit your current circumstances. You will be back on track in no time at all. As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 629

Message 10:

We haven’t received an update from you on your participation in aerobic activity. To see your progress, fill out the graphs to the right.

In the last update we received, although you decreased your aerobic activity since the first assessment, you were exercising at a level that has fantastic health benefits and meets the recommended guidelines for cancer survivors.

In the coming months aim to maintain a level of activity that meets the recommended guidelines for cancer survivors. As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 608

Message 11:

We haven’t received an update from you on your participation in aerobic activity. To see your progress, fill out the graphs to the right.

In the last update we received, your participation in aerobic activity had not changed substantially since the first assessment. How did you go this month? Have you increased your activity level?

Even just a small increase in activity will have substantial health benefits. Over the next week, focus on doing an extra 20-30 minutes of activity. Pay attention to how you feel afterwards; it may help motivate you to do an additional 20-30 minutes the next week.

Character count: 618

Message 12:

We haven’t received an update from you on your participation in aerobic activity. To see your progress, fill out the graphs to the right.

In the last update we received, you were exercising at a level that has fantastic health benefits and meets the recommended guidelines. How did you go this month? Have you maintained your activity level?

In the coming months aim to maintain a level of activity that meets the recommended guidelines for cancer survivors. As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 534
Message 13:

We haven’t received an update from you on your participation in aerobic activity. To see your progress, fill out the graphs to the right.

Have you increased your activity level since the first assessment? If you haven’t made any changes, there are lots of reasons why this might be the case. Changing your behaviour can be difficult and it may take a few attempts before you are able to enjoy physical activity as a regular part of your life. The main thing is that you keep aiming to do as much as you can.

Even just a small increase in activity will have substantial health benefits. Over the next week, focus on doing an extra 20-30 minutes of activity.

As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 656

Message 14:

We haven’t received an update from you on your participation in aerobic activity. To see your progress, fill out the graphs to the right.

In the first assessment, you were exercising at a level that has fantastic health benefits and meets the recommended guidelines. How did you go this month? Have you maintained your activity level?

In the coming months aim to maintain a level of activity that meets the recommended guidelines for cancer survivors. As your body gets stronger and fitter, you’ll only feel better and better.

Character count: 527

Message 15:

We haven’t received any information from you on your participation in aerobic activity. Take a moment to fill out the graphs yourself to see your results.

Do you participate in aerobic activity at a level that meets the guidelines? The main thing to remember is that some activity is better than none, and that the more you do the more health benefits you will gain. Any increase in your activity, even just a small amount, will help your body become stronger and fitter.

Your ultimate goal is to participate in at least 30 minutes of moderate intensity aerobic activity at least 5 days of the week. Good luck and we hope you are on track.

Character count: 648

Graph (F_aerobic_graph3_mins)

Column Graph – Average Minutes of activity (max value = 500)

Colum1.

○ I_PA1.AR.ST_Mod_Mins
Column 2
- I_PA1.1update.AR.ST_Mod_Mins

Column 3
- I_PA1.2update.AR.ST_Mod_Mins

X axis variable labels:
Column 1 - 3 months ago
Column 2 - 2 months ago
Column 3 - Last month

X axis title: Your participation in aerobic activity
Y axis – “mins of activity per/week”

4. Your Resistance-Based Activity
   (F_resistance_performance3).

Location: Newsletter 3, page 2

Message: How are you going?

Communication objective:
- Provide feedback on progress over the last three months
  - Highlight change in activity levels since baseline
- Praise/Encourage regular resistance PA over time (maintenance)
- Reinforce need for rest day between sessions

Message Parameters
Type: Tailored message blocks
Length: Character count 375 - 684

Origin: Update card 2, Update card 1 (if UPC2 data missing) Baseline Survey

Text

<table>
<thead>
<tr>
<th>Doing at least 3 sessions at time up date card 2</th>
<th>I_PA1.2update_RES.baseline.change_sess = 1</th>
<th>Message 1</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>Expression</th>
<th>Message</th>
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</thead>
<tbody>
<tr>
<td>Doing at least 1 session at the time of update card 2</td>
<td>( R_{PA1.2update.Res_Sess} \geq 3 ) ( I_{PA1.2update.RES.baseline.change_sess} = 2 )</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>( R_{PA1.2update.Res_Sess} \geq 3 ) ( I_{PA1.2update.RES.baseline.change_sess} = 3 )</td>
<td>3</td>
</tr>
<tr>
<td>Not doing any sessions at the time of update card 2</td>
<td>( R_{PA1.2update.Res_Sess} \geq 0 ) ( I_{PA1.2update.RES.baseline.change_sess} = 2 )</td>
<td>4</td>
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<tr>
<td></td>
<td>( R_{PA1.2update.Res_Sess} \geq 0 ) ( I_{PA1.2update.RES.baseline.change_sess} = 3 )</td>
<td>5</td>
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<tr>
<td>No update card returned/data missing</td>
<td>Doing 3 sessions at the time of update card 1 ( R_{PA1.1update.Res_Sess} \geq 3 )</td>
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</tr>
<tr>
<td>No update card returned/data missing</td>
<td>Doing at least 1 session at the time of update card 1 ( R_{PA1.1update.Res_Sess} \geq 1 )</td>
<td>7</td>
</tr>
<tr>
<td>No update card returned/data missing</td>
<td>Not doing any sessions at the time of update card 1 ( R_{PA1.1update.Res_Sess} \geq 0 )</td>
<td>8</td>
</tr>
<tr>
<td>Update card 1 and 2 not returned</td>
<td></td>
<td>9</td>
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</tbody>
</table>

*Note: The above table outlines the conditions and corresponding messages for different scenarios related to update card session completion.*
<table>
<thead>
<tr>
<th>Doing at least 3 sessions at baseline</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R_PA1.RES_Sess = ≥ 3</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Update card 1 and 2 not returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doing at least 1 sessions at baseline</td>
</tr>
<tr>
<td>R_PA1.RES_Sess = ≥ 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Update card 1 and 2 not returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not doing any sessions at baseline</td>
</tr>
<tr>
<td>R_PA1.RES_Sess = 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELSE</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Algorithms</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF R_PA1.2update.Res_Sess = ≥ 3 AND I_PA1.2update_RES.baseline.change_sess = 1 THEN 1</td>
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</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = ≥ 3 AND I_PA1.2update_RES.baseline.change_sess = 3 THEN 3</td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = ≥ 1 AND I_PA1.2update_RES.baseline.change_sess = 1 THEN 4</td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = ≥ 1 AND I_PA1.2update_RES.baseline.change_sess = 2 THEN 5</td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = ≥ 1 AND I_PA1.2update_RES.baseline.change_sess = 3 THEN 6</td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = 0 AND I_PA1.2update_RES.baseline.change_sess = 2 THEN 7</td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = 0 AND I_PA1.2update_RES.baseline.change_sess = 3 THEN 8</td>
</tr>
<tr>
<td>ELSE IF R_PA1.1update.Res_Sess = ≥ 3 THEN 9</td>
</tr>
<tr>
<td>ELSE IF R_PA1.1update.Res_Sess = ≥ 1 THEN 10</td>
</tr>
<tr>
<td>ELSE IF R_PA1.1update.Res_Sess = 0 THEN 11</td>
</tr>
<tr>
<td>ELSE IF R_PA1.Res_Sess = ≥ 3 THEN 12</td>
</tr>
<tr>
<td>ELSE IF R_PA1.Res_Sess = ≥ 1 THEN 13</td>
</tr>
</tbody>
</table>

Message 13

Message 14

Message 15
ELSE IF R_PA1_Res_Sess ≥ 0 THEN 14
ELSE THEN 15

Consistent:

Header: Your Resistance-Based Activity

GRAPH:

Header: Average Number of Sessions Per Week
Average Number of Exercises Per Week
Average Number of Repetitions Per Week

**********************************************************************

Message 1:
You are doing great. It’s fantastic to see that you have increased your resistance training and are exercising at the recommended level.
Congratulations on your success over the past 3 months. Keep up the good work!

**********************************************************************

Character count: 213

**********************************************************************

Message 2:
You are doing great. It’s fantastic to see that you have maintained a level of resistance training that meets the recommended guidelines.
Congratulations on your success over the past 3 months. Keep up the good work!

**********************************************************************

Character count: 212

**********************************************************************

Message 3:
You are doing great. It’s fantastic to see that you have maintained a level of resistance training that meets the recommended guidelines.
Congratulations on your success over the past 3 months. Keep up the good work!

**********************************************************************

Character count: 212

**********************************************************************

Message 4:
You are doing great. It’s fantastic to see that you have increased your level of resistance training. Keep going with your routine. Remember to progress slowly and as your strength increases to challenge your
muscles by slightly increasing the intensity of your workout. If you can, aim to complete an additional session of resistance training this week.

Congratulations on your success over the past 3 months. Keep up the good work!

Message 5:

Don’t worry that you your participation in resistance training decreased this past month. There are lots of things that can get in the way of your training, especially if it isn’t yet a regular part of your life.

Keep going with your routine. Remember to plan ahead and progress slowly. As your strength increases, challenge your muscles by slightly increasing the intensity of your workout.

Congratulations on your success over the past 3 months. Keep up the good work!

Message 6:

Congratulations for maintaining your participation in resistance training. It is great to see that resistance training is a regular part of your life.

Keep going with your routine. Remember to progress slowly and as your strength increases to challenge your muscles by slightly increasing the intensity of your workout. If you can, aim to complete an additional session of resistance training this week.

Congratulations on your success over the past 3 months. Keep up the good work!

Message 7:

Don’t worry that you didn’t participate in any resistance training this past month. There are lots of things that can get in the way of your training, especially if it isn’t yet a regular part of your life.

Remember, the best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them. Start by focusing on doing 1 or 2 small sessions a week and progress from there. You’ll be on track in no time!

Message 8:

Don’t worry that you haven’t yet started your resistance training routine.
Think about what is holding you back and come up with some possible solutions. Remember, the best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them. Aim to do just 1 small session this week and progress from there. You’ll be on track in no time!

Character count: 345

Message 9:

We didn’t receive an update from you this time on your participation in resistance training. We hope you are making good progress.

Take a moment to fill out the graphs yourself to see your results.

How are you going? Did you maintain your participation in resistance training? Remember, the best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them.

If you are still finding it hard to increase your activity, think about what is holding you back and come up with some possible solutions.

Character count: 540

Message 10:

We didn’t receive an update from you this time on your participation in resistance training. We hope you are making good progress.

Take a moment to fill out the graphs yourself to see your results.

How are you going? Did you increase your participation in resistance training? Remember, the best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them.

If you are still finding it hard to increase your activity, think about what is holding you back and come up with some possible solutions.

Character count: 535

Message 11:

We didn’t receive an update from you this time on your participation in resistance training. We hope you are making good progress.

Take a moment to fill out the graphs yourself to see your results.

How are you going? Did you increase your participation in resistance training? Remember, the best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them.
If you are still finding it hard to increase your activity, think about what is holding you back and come up with some possible solutions. Aim to do just 1 small session this week and progress from there. You’ll be on track in no time!

Character count: 632

Message 12:

We didn’t receive any updates from you on your participation in resistance training. We hope you are making good progress.

Take a moment to fill out the graphs yourself to see your results.

How are you going? Are you still meeting the guidelines? Remember, the best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them.

If you are still finding it hard to increase your activity, think about what is holding you back and come up with some possible solutions.

Character count: 505

Message 13:

We didn’t receive any updates from you on your participation in resistance training. We hope you are making good progress.

Take a moment to fill out the graphs yourself to see your results.

How are you going? Did you maintain your participation in resistance training? Remember, the best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them.

If you are still finding it hard to increase your activity, think about what is holding you back and come up with some possible solutions.

Character count: 528

Message 14:

We didn’t receive any updates from you on your participation in resistance training. We hope you are making good progress.

Take a moment to fill out the graphs yourself to see your results.

How are you going? Did you complete any resistance training? Remember, the best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them.
If you are still finding it hard to increase your activity, think about what is holding you back and come up with some possible solutions. Aim to do just 1 small session this week and progress from there. You’ll be on track in no time!

**********************************************************************
Character count: 613
**********************************************************************

**Message 15:**

How much resistance training have you completed each week over the past 3 months? Does your level of activity meet the recommended guidelines? Take a moment to fill out the graphs to see your results.

The best way to stay on track and overcome barriers is to plan ahead, set achievable goals and commit to meeting them. Remember to progress slowly and as your strength increases to challenge your muscles by slightly increasing the intensity of your workout.

If you are still finding it hard to increase your activity, think about what is holding you back and come up with some possible solutions.

**********************************************************************
Character count: 596
**********************************************************************

5. **Are you sitting too much? (F_sitting_performance3)**

**Location:** Newsletter 3, page 3

**Message:**

**Communication objective:**

- Provide feedback on sitting time over the past three months.
- Provide tailored tips on how to reduce sitting time

**Message Parameters**

**Type:** Tailored message blocks

**Length:** max 1447

**Origin:** Update card 2, Update card 1 (if UPC2 data missing) Baseline Survey (if update data missing)
# Feedback variables

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**Algorithms**

**Message 1 and 2**
- I_Sit1.2update_combined_Wrk
- I_Sit1.2update_combined_TV
- I_Sit1.2update_combined_trav
- I_Sit1.2update_combined_CPU

**Message 3 and 4**
- I_Sit1.1update_combined_trav
- I_Sit1.1update_combined_Wrk
- I_Sit1.1update_combined_TV
- I_Sit1.1update_combined_CPU

**Message 5 and 6**
- I_Sit1_combined_trav
- I_Sit1_combined_wrk

**Message 6**
- I_Sit1_combined_total ≤ 480
  - I_Sit1_combined_trav ≥ 60
  - I_Sit1_combined_wrk ≥ 60
  - I_Sit1_combined_cpu ≥ 60

**Message 7**
- ELSE

Tailored tips within each message are micro-tailored based on the following intermediate variables when the score = ≥ 60 9 IF SCORE < 60 – no tip given).
Message 1:

Are you sitting too much?

Your results indicate that you need to spend less time sitting down. It’s easy to spend too much time sitting – we sit down to eat, we sit down for transport, we sit down to work and we sit down to relax and enjoy leisure time with our family and friends.

It isn’t always possible to replace sitting with other activities and we certainly can’t be expected to be active 24 hours a day! The good news is that regular breaks from sitting (even just simply standing up) can help to reduce the health risk associated with prolonged sitting.

Here are a few things you can do that can help you break up your sitting time:

- **IF** $I_{Sit1.2update\_combined\_CPU} \geq 60$ **THEN** Set a timer for 30 minute intervals while you are on your computer at home (check out www.tomato-timer.com). When the timer goes off stand up and stretch.
- **IF** $I_{Sit1.2update\_combined\_TV} \geq 60$ **THEN** When you are watching TV, stand up and walk around the house during commercials or do some stretching while you watch.
- **IF** $I_{Sit1.2update\_combined\_Wrk} \geq 60$ **THEN** Change the way you communicate with your colleagues at work. When appropriate, deliver a message in person rather than by email or phone.
- **IF** $I_{Sit1.2update\_combined\_Wrk} \geq 60$ **THEN** Eat your lunch away from your desk.
- **IF** $I_{Sit1.2update\_combined\_Wrk} \geq 60$ **THEN** Move your bin away from your desk so that you have to stand to put something in.
- **IF** $I_{Sit1.2update\_combined\_trav} \geq 60$ **THEN** Plan regular breaks during long car trips or stand up when you are on public transport.
- When you sit down, set your watch or phone to remind you to stand up every half an hour or every hour.
- Schedule in 10 minutes of physical activity during the time that you would usually spend sitting.

Maximum CC 1421

**************************************************************

Message 2

Are you sitting too much?

Great news - your results indicate that you do not spend too much of your time sitting down. It is great that you are keeping active.

For times when it is necessary to sit, taking regular breaks from sitting (even just simply standing up) can help to reduce the health risk associated with prolonged sitting.
Here are a few things you can do that can help you break up your sitting time:

- **IF** $I_{Sit1.2update\_combined\_CPU} \geq 60$ **THEN** Set a timer for 30 minute intervals while you are on your computer at home (check out [www.tomato-timer.com](http://www.tomato-timer.com)). When the timer goes off stand up and stretch.

- **IF** $I_{Sit1.2update\_combined\_TV} \geq 60$ **THEN** When you are watching TV, stand up and walk around the house during commercials or do some stretching while you watch.

- **IF** $I_{Sit1.2update\_combined\_Wrk} \geq 60$ **THEN** Change the way you communicate with your colleagues at work. When appropriate, deliver a message in person rather than by email or phone.

- **IF** $I_{Sit1.2update\_combined\_Wrk} \geq 60$ **THEN** Eat your lunch away from your desk.

- **IF** $I_{Sit1.2update\_combined\_Wrk} \geq 60$ **THEN** Move your bin away from your desk so that you have to stand to put something in.

- **IF** $I_{Sit1.2update\_combined\_trav} \geq 60$ **THEN** Plan regular breaks during long car trips or stand up when you are on public transport.

- When you sit down, set your watch or phone to remind you to stand up every half an hour or every hour.

- Schedule in 10 minutes of physical activity during the time that you would usually spend sitting.

******************************************************************************

**CC 1382**

******************************************************************************

**Message 3**

Are you sitting too much?

Your results from update card 1 indicate that you need to spend less time sitting down. It’s easy to spend too much time sitting – we sit down to eat, we sit down for transport, we sit down to work and we sit down to relax and enjoy leisure time with our family and friends.

It isn’t always possible to replace sitting with other activities and we certainly can’t be expected to be active 24 hours a day! The good news is that regular breaks from sitting (even just simply standing up) can help to reduce the health risk associated with prolonged sitting.

Here are a few things you can do that can help you break up your sitting time:

- **IF** $I_{Sit1.2update\_combined\_CPU} \geq 60$ **THEN** Set a timer for 30 minute intervals while you are on your computer at home (check out [www.tomato-timer.com](http://www.tomato-timer.com)). When the timer goes off stand up and stretch.

- **IF** $I_{Sit1.2update\_combined\_TV} \geq 60$ **THEN** When you are watching TV, stand up and walk around the house during commercials or do some stretching while you watch.

- **IF** $I_{Sit1.2update\_combined\_Wrk} \geq 60$ **THEN** Change the way you communicate with your colleagues at work. When appropriate, deliver a message in person rather than by email or phone.
• **IF** \( I_{\text{Sit1.2update\_combined\_Wrk}} \geq 60 \) **THEN** Eat your lunch away from your desk.

• **IF** \( I_{\text{Sit1.2update\_combined\_Wrk}} \geq 60 \) **THEN** Move your bin away from your desk so that you have to stand to put something in.

• **IF** \( I_{\text{Sit1.2update\_combined\_trav}} \geq 60 \) **THEN** Plan regular breaks during long car trips or stand up when you are on public transport.

• When you sit down, set your watch or phone to remind you to stand up every half an hour or every hour.

• Schedule in 10 minutes of physical activity during the time that you would usually spend sitting.

*****************************************************************************

Maximum CC 1440

*****************************************************************************

**Message 4**

Are you sitting too much?

Great news - your results from update card 1 indicate that you do not spend too much of your time sitting down. It is great that you are keeping active.

For times when it is necessary to sit, taking regular breaks from sitting (even just simply standing up) can help to reduce the health risk associated with prolonged sitting.

Here are a few things you can do that can help you break up your sitting time:

• **IF** \( I_{\text{Sit1.2update\_combined\_CPU}} \geq 60 \) **THEN** Set a timer for 30 minute intervals while you are on your computer at home (check out [www.tomato-timer.com](http://www.tomato-timer.com)). When the timer goes off stand up and stretch.

• **IF** \( I_{\text{Sit1.2update\_combined\_TV}} \geq 60 \) **THEN** When you are watching TV, stand up and walk around the house during commercials or do some stretching while you watch.

• **IF** \( I_{\text{Sit1.2update\_combined\_Wrk}} \geq 60 \) **THEN** Change the way you communicate with your colleagues at work. When appropriate, deliver a message in person rather than by email or phone.

• **IF** \( I_{\text{Sit1.2update\_combined\_Wrk}} \geq 60 \) **THEN** Eat your lunch away from your desk.

• **IF** \( I_{\text{Sit1.2update\_combined\_Wrk}} \geq 60 \) **THEN** Move your bin away from your desk so that you have to stand to put something in.

• **IF** \( I_{\text{Sit1.2update\_combined\_trav}} \geq 60 \) **THEN** Plan regular breaks during long car trips or stand up when you are on public transport.

• When you sit down, set your watch or phone to remind you to stand up every half an hour or every hour.

• Schedule in 10 minutes of physical activity during the time that you would usually spend sitting.

*****************************************************************************
Message 5

Are you sitting too much?

Your results from the first assessment indicate that you need to spend less time sitting down. It’s easy to spend too much time sitting – we sit down to eat, we sit down for transport, we sit down to work and we sit down to relax and enjoy leisure time with our family and friends.

It isn’t always possible to replace sitting with other activities and we certainly can’t be expected to be active 24 hours a day! The good news is that regular breaks from sitting (even just simply standing up) can help to reduce the health risk associated with prolonged sitting.

Here are a few things you can do that can help you break up your sitting time:

- **IF** $I_{\text{Sit1.2update\_combined\_CPU}} \geq 60$ **THEN** Set a timer for 30 minute intervals while you are on your computer at home (check out [www.tomato-timer.com](http://www.tomato-timer.com)). When the timer goes off stand up and stretch.

- **IF** $I_{\text{Sit1.2update\_combined\_TV}} \geq 60$ **THEN** When you are watching TV, stand up and walk around the house during commercials or do some stretching while you watch.

- **IF** $I_{\text{Sit1.2update\_combined\_Wrk}} \geq 60$ **THEN** Change the way you communicate with your colleagues at work. When appropriate, deliver a message in person rather than by email or phone.

- **IF** $I_{\text{Sit1.2update\_combined\_Wrk}} \geq 60$ **THEN** Eat your lunch away from your desk.

- **IF** $I_{\text{Sit1.2update\_combined\_Wrk}} \geq 60$ **THEN** Move your bin away from your desk so that you have to stand to put something in.

- **IF** $I_{\text{Sit1.2update\_combined\_trav}} \geq 60$ **THEN** Plan regular breaks during long car trips or stand up when you are on public transport.

- When you sit down, set your watch or phone to remind you to stand up every half an hour or every hour.

- Schedule in 10 minutes of physical activity during the time that you would usually spend sitting.

Maximum CC 1447

Message 6

Are you sitting too much?

Great news - your results from the first assessment indicate that you do not spend too much of your time sitting down. It is great that you are keeping active.

For times when it is necessary to sit, taking regular breaks from sitting (even just simply standing up) can help to reduce the health risk associated with prolonged sitting.
Here are a few things you can do that can help you break up your sitting time:

• IF I_Sit1.2update_combined_CPU = ≥ 60 THEN Set a timer for 30 minute intervals while you are on your computer at home (check out www.tomato-timer.com). When the timer goes off stand up and stretch.

• IF I_Sit1.2update_combined_TV = ≥ 60 THEN When you are watching TV, stand up and walk around the house during commercials or do some stretching while you watch.

• IF I_Sit1.2update_combined_Wrk = ≥ 60 THEN Change the way you communicate with your colleagues at work. When appropriate, deliver a message in person rather than by email or phone.

• IF I_Sit1.2update_combined_Wrk = ≥ 60 THEN Eat your lunch away from your desk.

• IF I_Sit1.2update_combined_Wrk = ≥ 60 THEN Move your bin away from your desk so that you have to stand to put something in.

• IF I_Sit1.2update_combined_trav ≥ 60 THEN Plan regular breaks during long car trips or stand up when you are on public transport.

• When you sit down, set your watch or phone to remind you to stand up every half an hour or every hour.

• Schedule in 10 minutes of physical activity during the time that you would usually spend sitting.

************************************************************************************

CC 1431

************************************************************************************

Message 7

Are you sitting too much?

How much time do you spend sitting down? It’s easy to spend too much time sitting – we sit down to eat, we sit down for transport, we sit down to work and we sit down to relax and enjoy leisure time with our family and friends.

It isn’t always possible to replace sitting with other activities and we certainly can’t be expected to be active 24 hours a day! The good news is that regular breaks from sitting (even just simply standing up) can help to reduce the health risk associated with prolonged sitting.

Here are a few things you can do that can help you break up your sitting time:

• Set a timer for 30 minute intervals while you are on your computer at home (check out [www.tomato-timer.com](http://www.tomato-timer.com)). When the timer goes off - stand up and stretch.

• When you are watching TV, stand up and walk around the house during commercials or do some stretching while you watch.

• Change the way you communicate with your colleagues at work. When appropriate, deliver a message in person rather than by email or phone.

• Eat your lunch away from your desk

• Move your bin away from your desk so that you have to stand to put something in it
• Plan regular breaks during long car trips or stand up when you are on public transport.
• Eat your lunch away from your desk
• Move your bin away from your desk so that you have to stand to put something in it
• Plan regular breaks during long car trips or stand up when you are on public transport.

*********************************************************************************

Physical Activity as Part of Your Lifestyle
(F_Supportenv3)

Location: Newsletter 3, Page 3

Message: Tips for integrating PA into your lifestyle

Communication objective:

• Enhance individuals confidence for overcoming PA barriers (Enhance self-efficacy)
• Provide practical solutions based on the individuals work status, local environment, and health issues

Message parameters

Type: Micro tailoring
Length: CC 1332-1690
Origin: Work status (Section A, Q4); Environment (Section E, Q6b, e, f);

Feedback variables

R_Work1
R_EQUIP1
R_ENV1_shops
Message:

6. Look for opportunities to be active throughout the day.
   - Take the stairs instead of the lift.
   - Park further away from your destination than usual and walk the extra distance.
   - If \( R_{Work1} = 1 \) or \( R_{Work1} = 2 \) THEN Go for a walk in your lunch break at work.
   - If \( R_{Equipment1} = 5 \) AND \( R_{Pref\_exercise\_type} \geq 3 \) THEN Ride a bike instead of driving.
   - If \( R_{Pref\_exercise\_type}.b \geq 3 \) THEN Walk to the shops when you only need a few things.
   - Plan active social outings (e.g. visit a museum or art gallery opening instead of sitting down at the movies).

7. Create a supportive home environment.
   {IF \( R_{Pref\_exercise\_type}.f \leq 2 \) THEN} What can you do to make your home more exercise friendly? Perhaps you can put a mat down to do stretches, invest in some exercise materials (e.g. clothes, DVDs, Dumbbells), or use prompts around the house (e.g. a post-it note next to the fridge or the TV) reminding you of your goals.

   ELSE IF \( R_{Pref\_exercise\_type}.f \geq 3 \) THEN What can you do to make your home more exercise friendly? Perhaps you can put a mat down to do stretches, move some furniture around to make more space to do your exercises, or make a list of all the places near your home that would be ideal for walking or exercising and keep the list on your fridge as a reminder.

   IF \( R_{Equipment1} = 1 \) OR IF \( R_{Equipment1} = 2 \) Remind yourself to use your exercise equipment by keeping it somewhere visible in your home (such as in the lounge room). If you have a separate room for your equipment, do what you can to make it an uplifting space.

8. Restructure your time.
   - Get up half an hour earlier or go to bed half an hour later to fit in your exercise.
   - Combine exercise with other activities (e.g. stretching while watching TV; walking while catching up with a friend).
   - Schedule in physical activity just as you would any other appointment. Plan your week in advance to ensure you fit in exercise along with your other commitments.
9. Getting Help

Location: Newsletter 3, page 4

Message: Getting help

Communication objective:

- Provide participants with links to where they can find professional help from an EP

Message parameters

Type: Micro tailoring

Length: 523

Feedback variables

R_internet.home1 (1 no; 2 yes)
R_internet.work1 (1 no; 2 yes)

Message:

If you would like help designing or re-evaluating your exercise program, consider making an appointment with an exercise physiologist or certified exercise professional that is knowledgeable about breast cancer and its treatment. Contact Exercise and Sport Science Australia (details right) to find an exercise physiologist near you. If you are worried about the cost speak to your GP. You may be eligible for a Medicare rebate via an enhanced primary care plan.
Further Information and Support (F_further_information3)

Location: Newsletter 3, page 4

Message: Where can you find further information?

Communication objective:
- Provide participants with links to where they can find more information

Message parameters

Type: Micro tailoring
Length: 463-637
Origin: Consent form, Baseline survey (Section A, Q14, Q15).

Feedback variables

R_state
R_internet.home1 (1 no; 2 yes)
R_internet.work1 (1 no; 2 yes)

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Algorithms

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ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = NSW THEN 2
ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = VIC THEN 3
ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = TAS THEN 4
ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = NT THEN 5
ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = SA THEN 6
ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = ACT THEN 7
ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = QLD THEN 8
ELSE IF R_internet.home1 = 1 OR IF R_internet.work1 = 1 THEN 9
ELSE THEN 9

Message 1:

Be Active WA
www.beactive.wa.gov.au
Includes information on physical activity programs and support services in WA.

Cancer Council WA
www.cancerwa.asn.au
Under the patients, family and friends tab there is a section on living well after cancer.

YWCA Encore
www.ywcaencore.org.au
A free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sports Science Australia
www.essa.org.au
Type in your area code on this website to find an exercise physiologist in your area.

Active Australia
www.activeaustralia.com
Plan an active trip!

*********************************************************************
617 characters
*********************************************************************

Message 2:

Get active NSW
Includes information on physical activity programs and support services in NSW.

Cancer Council NSW
www.cancer council.com.au
Under the patients, family and friends tab there is a link to a living well after cancer program.
YWCA Encore
www.ywcaencore.org.au
A free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sports Science Australia
www.essa.org.au
Type in your area code on this website to find an exercise physiologist in your area.

Active Australia
www.activeaustralia.com
Plan an active trip!

******************************************************************************
638 characters
******************************************************************************

Message 3:

Better health channel
www.betterhealth.vic.gov.au
Includes information on physical activity programs and support services in VIC.

Cancer Council
www.cancer.org.au
You can access some “move your body tips” under the cancer smart lifestyle tab.

YWCA Encore
www.ywcaencore.org.au
A free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sports Science Australia
www.essa.org.au
Type in your area code on this website to find an exercise physiologist in your area.

Active Australia
www.activeaustralia.com
Plan an active trip!

******************************************************************************
618 characters
******************************************************************************

Message 4:

Get moving Tasmania
www.getmoving.tas.gov.au
Includes information on physical activity programs and support services in Tasmania.

Cancer Council Tasmania  
www.cancertas.org.au  
Includes information on healthy living and living well after cancer.

YWCA Encore  
www.ywcaencore.org.au  
A free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sports Science Australia  
www.essa.org.au  
Type in your area code on this website to find an exercise physiologist in your area.

Active Australia  
www.activeaustralia.com  
Plan an active trip!

*********************************************************************
621 characters
*********************************************************************

Message 5:

Cancer Council NT  
www.cancercouncilnt.com.au  
Includes information on the exercise program “Your Body, Your Mind, Your Life”.

YWCA Encore  
www.ywcaencore.org.au  
A free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sports Science Australia  
www.essa.org.au  
Type in your area code on this website to find an exercise physiologist in your area.

Active Australia  
www.activeaustralia.com  
Plan an active trip!

*********************************************************************
495 characters
*********************************************************************
Message 6:

Be Active SA  
beactive.com.au  
Includes information on physical activity programs and support services in SA.

Cancer Council SA  
www.cancersa.org.au  
Includes information on education programs about how to stay healthy after cancer.

YWCA Encore  
www.ywcaencore.org.au  
A free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sports Science Australia  
www.essa.org.au  
Type in your area code on this website to find an exercise physiologist in your area.

Active Australia  
www.activeaustralia.com  
Plan an active trip!

*********************************************************************
602 characters
*********************************************************************

Message 7:

www.actcancer.org  
Includes information on education programs about living well after cancer.

YWCA Encore  
www.ywcaencore.org.au  
A free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sports Science Australia  
www.essa.org.au  
Type in your area code on this website to find an exercise physiologist in your area.

Active Australia  
www.activeaustralia.com  
Plan an active trip!

*********************************************************************
466 characters
*********************************************************************
Message 8:

Cancer Council QLD
www.cancerqld.org.au
Includes information on health education programs for survivors and how to find health information on the internet.

YWCA Encore
www.ywcaencore.org.au
A free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sports Science Australia
www.essa.org.au
Type in your area code on this website to find an exercise physiologist in your area.

Active Australia
www.activeaustralia.com
Plan an active trip!

Message 9

The Cancer Council helpline
PH: 13 11 20
Ask for information on the support and healthy living services available in your area.

YWCA Encore
PH: 1800 305 150
Free 8 week gentle exercise program for breast cancer survivors.

Exercise and Sport Science Australia
PH: (07) 3856 5622
They may be able to help you find an exercise physiologist in your area.

Active Australia
PH: 800 661 9073
Plan an active trip!
10. Your Action Plan (F_Actionplannin3)

Location: Newsletter 3, page 4

Message: Action planning

Communication objective:

- Promote use of behaviour change techniques
- Provide feedback on goal setting behaviour

Message parameters

Type: Message blocks
Length: 634-1056
Origin: Update card 2

Feedback variables

R_updatecard2_setgoal
R_updatecard2_metgoal.
R_updatecard1_setgoal
R_updatecard1_metgoal.

<table>
<thead>
<tr>
<th>Set goal N2</th>
<th>Met goal</th>
<th>Set goal after N3</th>
<th>Met goal</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Didn’t meet goal</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Didn’t set goal</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Didn’t meet goal</td>
<td>Set goal after N3</td>
<td>Met goal</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Didn’t meet goal</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Didn’t set goal</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
Algorithms

IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 2 AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 2 THEN 1

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 2 AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 1 THEN 2

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 2 AND IF R_updatecard2_setgoal = 1 THEN 3

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 1 IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 2 THEN 4

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 1 IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 1 THEN 5

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 1 IF R_updatecard2_setgoal = 1 THEN 6

IF R_updatecard1_setgoal = 1 AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 2 THEN 7

IF R_updatecard1_setgoal = 1 AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 1 THEN 8

IF R_updatecard1_setgoal = 1 AND IF R_updatecard2_setgoal = 1 THEN 9

IF R_updatecard1_setgoal = empty AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 2 THEN 7

IF R_updatecard1_setgoal = empty AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 1 THEN 8

IF R_updatecard1_setgoal = empty AND IF R_updatecard2_setgoal = 1 THEN 9

IF R_updatecard1_setgoal = empty AND IF R_updatecard2_setgoal = empty THEN 9

ELSE 9
**Message 1**

**Main issue:** This person set a goal after N1 and achieved it AND set goal after N2 and achieved it.

**Message concepts:**

- Praise for maintaining goal setting behaviour
- Praise for meeting goal
- Encourage person to use rewards to reinforce behaviour

**Message:**

Well done! You have stuck to your action plans and met the goals you set for yourself over the past 2 months. This is a fantastic result!

Continue to regularly plan your activity and set new goals. As you know, developing an action plan is a really useful motivational tool and helps you to quickly progress.

Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

************************************************************************************

Character count 629

************************************************************************************

**Message2**

**Main issue:** This person set a goal after N1 and achieved it AND set goal after N2 and DID NOT ACHIEVE IT

**Message concepts:**

- Praise for setting another goal
- Encourage person to reflect. Did they set the goal to high or do they need to change a few things in order for the goal to be achievable.
- Encourage the use of rewards

**Message:**

Well done for setting another goal after newsletter 2. It is great to see you taking part in this important process. Don’t worry that it wasn’t achieved; you may just need to adjust your goals to make them more attainable.
Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

******************************************************************************
Character count 534
******************************************************************************

Message 3

Main issue: This person set a goal after N1 and achieved it BUT didn’t set a goal after N2.

Message concepts:

- Highlight usefulness of goal setting
- Encourage them to set a goal
- Encourage the use of rewards

Message:

You may not feel like you need to set any more goals but we would like to encourage you to stick with it. Developing an action plan is a really useful motivational tool and helps you to quickly progress.

Think about how you can improve your physical activity routine. Is there something that you are not doing that you could be doing? Could you benefit from doing more exercise, sitting less or stretching more? Remember to write down your weekly goals using specific details.

Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

******************************************************************************
Character count 786
******************************************************************************

Message 4

Main issue: This person set a goal after N1 and didn’t achieve it AND set goal after N2 and achieved it.

Message concepts:

- Praise for giving goal setting another goal and achieving goal this time
Encourage person to use rewards to reinforce behaviour

Message:

Well done! It is great to see that you came up with a new action plan and succeeded in meeting your goals! Congratulations, this is a great achievement.

Continue to regularly plan your activity and set new goals. As you know, developing an action plan is a really useful motivational tool and helps you to quickly progress.

Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

*************************************************************************************
Character count 636
*************************************************************************************

Message 5

Main issue: This person set a goal after N1 and didn’t achieve it AND set goal after N2 and DID NOT ACHIEVE IT

Message concepts:

• Praise for setting another goal

• Encourage person to reflect. Did they set the goal to high or do they need to change a few things in order for the goal to be achievable.

• Encourage the use of rewards

Message:

Well done for setting another goal after newsletter 2. It is great to see you taking part in this important process. Don’t worry that it wasn’t achieved; use your experiences over the past 2 months to come up with a more attainable action plan.

Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

Character count 557
*************************************************************************************
Message 6
Main issue: This person set a goal after N1 and didn’t achieve AND didn’t set a goal after N2.

Message concepts:

- Highlight usefulness of goal setting
- Encourage them to set a goal
- Encourage the use of rewards

Message:

Don’t give up on action planning! You may not feel like you need to set any more goals but we would like to encourage you to stick with it. Developing an action plan is a really useful motivational tool and helps you to quickly progress. If you are not meeting your goals, you may just need to adjust them so that they are more achievable.

Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

Character count 649

Message 7

Main issue: This person did not set a goal after N1 BUT they did set a goal and meet the goal after N2.

Message concepts:

- Praise for setting goal and congratulations for meeting goal
- Encourage them to set new goals
- Encourage the use of rewards

Message:

Well done! It is great to see that you came up with an action plan and succeeded in meeting your goals! Congratulations, this is a great achievement.

Continue to regularly plan your activity and set new goals. As you know, developing an action plan is a really useful motivational tool and helps you to quickly progress.

Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!
Write down some possible rewards and keep them in mind when you develop your action plan for this week:

************************************************************************************

Character count 633
************************************************************************************

Message 8

Main issue: This person did not set a goal after N1 BUT set goal after N2 and DID NOT ACHIEVE IT

Message concepts:

- Praise for setting goal
- Encourage person to reflect. Did they set the goal to high or do they need to change a few things in order for the goal to be achievable.
- Encourage the use of rewards

Message:

Well done for setting another goal after newsletter 2. It is great to see you taking part in this important process. Don’t worry that it wasn’t achieved; use your experiences over the past 2 months to come up with a more attainable action plan.

Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

************************************************************************************

Character count 554

Message 9

Main issue: This person did not set a goal after N1 AND did not set a goal after N2

Message concepts:

- Highlight usefulness of goal setting
- Encourage them to set a goal
- Encourage the use of rewards

Message:
As you know, for physical activity to be beneficial it must be done regularly and maintained over the long-term. Developing an action plan is a really useful motivational tool and helps you to quickly progress.

If you are in the habit of planning your physical activity each week, you can plan ahead for any upcoming changes in your schedule (such as going on holidays) or ensure you choose activities that are appropriate for the weather. Remember to write down your weekly goals using specific details.

Rewarding yourself for reaching any of your goals each month can also help keep you motivated. You may not need the extra incentive but it can be a great way to plan something nice for yourself – guilt free!

Write down some possible rewards and keep them in mind when you develop your action plan for this week:

************************************************************************************
Character count 814
************************************************************************************

11. **Our Best Wishes! (F_closingmessage3)**

Our best wishes

It has been a pleasure designing these newsletters for you and we hope that you have enjoyed reading them.

As you continue on your journey, remember that regular physical activity is an important part of cancer recovery and in maintaining good health. For physical activity to be beneficial, aerobic and resistance training should be done regularly throughout your lifetime and efforts should be made to reduce prolonged sitting time.

Setting goals and creating a supportive network will help you to stay on track and lead a more active lifestyle. If you would like more support or are interested in trying something new, you may want to contact one of the organisations listed to the left.

We wish you all the best,

The Move More For Life Team
Appendix 4.5: Variable tables and linking algorithms
### Variable tables and linking algorithms

Algorithm development begins by coding the tailoring assessment and the individual messages. Each question used to tailor information is given a variable name and each response option is assigned a corresponding value. At the same time, each message space on the feedback template is given a variable name and each tailored message is assigned a value corresponding to that variable name (notice variable names for each message in message concept booklet).

Algorithms simply the relationship among these different elements by creating one set of variable to represent information gathered from the assessment (raw variables), a second set of variables transforming the first into a more usable form (intermediate variables) and a third set of variables that denote the message blocks in the feedback (feedback variables).

**Raw variables:** Raw variables are created from the questions and response options contained in the tailoring assessment. Creating a raw variable table is the first step in writing algorithms.

**Intermediate variables:** Intermediate variables are those that transform, categorise, or summarise data from the raw variables. Creating an intermediate variable table is the second step in writing algorithms.

**Feedback variables:** Feedback variables determine what message from the message concept booklet will be placed in the corresponding message block on the newsletter template. Feedback variables are based on raw and/or intermediate variables and define the specific set of conditions under which a participant would receive a particular message. Creating a feedback variable table, including algorithms (decision rules) for each of the feedback variables is the final step.

The raw variable, intermediate and feedback variable tables used to design the Move More for Life intervention are presented below.
<table>
<thead>
<tr>
<th>Assessment Location</th>
<th>Variable Name</th>
<th>Description</th>
<th>Possible values</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSENT FORM</td>
<td>R_ID</td>
<td>Participants ID number</td>
<td>4 characters</td>
<td>Tracking</td>
</tr>
<tr>
<td></td>
<td>R_first.name</td>
<td>Participants first name</td>
<td>20 characters&lt;br&gt;Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td></td>
<td>R_state</td>
<td>Participants location (state)</td>
<td>3 characters&lt;br&gt;Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
</tbody>
</table>

| BASELINE SURVEY     |                     |                              |                                               |                          |
| Section A           | Demographics        |                              |                                               |                          |
| Q1                  | R_DOB               | Participants date of birth    |                                               | Tailoring N3             |
| Q4                  | R_employment1       | Which of the following best describes your current primary employment situation? | 1 Paid full-time employment (min 35hrs per week)<br>2 Paid part-time employment (less than 35hrs per week)<br>3 Casual employment | Tailoring N3             |
| Q14 | R_internet.home1 | Do you have access to the internet at home? | 1 No  
2 Yes  
Empty = not entered | Tailoring 3 |
|-----|------------------|------------------------------------------|-----------------------------|------------|
| Q15 | R_internet.work1 | Do you have access to the internet at work | 1 No  
2 Yes  
3 I do not work  
Empty = not entered | Tailoring 3 |
<table>
<thead>
<tr>
<th>Section C/step log</th>
<th>Physical activity</th>
<th>Description</th>
<th>Characters</th>
<th>Tailoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1a.a</td>
<td>R_PA1.AR.ST_Sess</td>
<td>Average number of sessions per week individual performed strenuous activity at baseline.</td>
<td>3 characters&lt;br&gt;Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q1a.b</td>
<td>R_PA1.AR.ST_Min</td>
<td>Average time of each session (in minutes) individual spent performing strenuous activity at baseline.</td>
<td>5 characters&lt;br&gt;Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q1b.a</td>
<td>R_PA1.AR.Mo_Sess</td>
<td>Average number of sessions per week individual performed moderate activity at baseline.</td>
<td>3 characters&lt;br&gt;Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q1b.b</td>
<td>R_PA1.AR.Mo_Min</td>
<td>Average time of each session (in minutes) individual spent performing moderate activity at baseline.</td>
<td>5 characters&lt;br&gt;Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q2a</td>
<td>R_PA1.RES_Sess</td>
<td>Average number of sessions per week individual performed resistance training exercises at baseline.</td>
<td>3 characters&lt;br&gt;Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q2b</td>
<td>R_PA1.RES_Ex</td>
<td>Average number of resistance exercises performed each session at baseline.</td>
<td>3 characters Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>-----</td>
<td>--------------</td>
<td>-----------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Q2c</td>
<td>R_PA1.RES_Rep</td>
<td>Average number of repetitions of each exercise performed each session at baseline</td>
<td>3 characters Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5a.a</td>
<td>R_Sit1.Trav_wd_mins</td>
<td>Average mins individual report sitting while travelling on a weekday at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5a.b</td>
<td>R_Sit1.Wrk_wd_mins</td>
<td>Average mins individual report sitting while at work on a weekday at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5b.a</td>
<td>R_Sit1.TV_wd_mins</td>
<td>Average mins individual report sitting while watching TV on a weekday at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5b.b</td>
<td>R_Sit1.CPU_wd_mins</td>
<td>Average mins individual report sitting while using computer at home on a weekday at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Question</td>
<td>Code</td>
<td>Description</td>
<td>Characters</td>
<td>Tailoring</td>
</tr>
<tr>
<td>------------</td>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Q5c.a</td>
<td>R_Sit1.LEIS_wd_mins</td>
<td>Average mins individual report sitting while during other leisure time on a weekday at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5c.b</td>
<td>R_Sit1.Trav_we_mins</td>
<td>Average mins individual report sitting while travelling on a weekend at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5d.a</td>
<td>R_Sit1.Wrk_we_mins</td>
<td>Average mins individual report sitting while at work on a weekend at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5d.b</td>
<td>R_Sit1.TV_we_mins</td>
<td>Average mins individual report sitting while watching TV on a weekend at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5e.a</td>
<td>R_Sit1.CPU_we_mins</td>
<td>Average mins individual report sitting while using computer at home on a weekend at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
<tr>
<td>Q5e.b</td>
<td>R_Sit1.LEIS_we_mins</td>
<td>Average mins individual report sitting while during other leisure time on a weekend at baseline.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N1, N2, N3</td>
</tr>
</tbody>
</table>
weekend at baseline.

| Q6 | R_PA.PrioD_AR_global | Has the amount of aerobic exercise you do changed since you were diagnosed with cancer? | 1 No, I do the same amount of aerobic activity now  
2 Yes, I do more aerobic exercise now  
3 Yes, I do less aerobic exercise now  
Empty = not entered | Tailoring N1 |
|----|----------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--|
| Q7 | R_PA.PrioD_RES_global | Has the amount of resistance exercise you do changed since you were diagnosed with cancer? | 1 No I do the same amount of resistance exercise now  
2 Yes, I do more resistance exercise now  
3 Yes, I do less resistance exercise now  
Empty = not entered | Tailoring N1 |

**Section D**  
**Psycho-Social**

| Q5b | R_Outcome_expectancy1.e | Over the next four months controlling my weight is | 1 unimportant  
2 important  
3 very important | Tailoring N1 |
| Q6b   | R_Outcome_expectancy1.f | Over the next four months regaining lost strength is | 1 unimportant  
|       |                          | Empty = not entered                                  | 2 important  
|       |                          | Empty = not entered                                  | 3 very important  
|       |                          | Empty = not entered                                  |
| Q9b   | R_Outcome_expectancy1.i | Over the next four months reducing fatigue is       | 1 unimportant  
|       |                          | Empty = not entered                                  | 2 important  
|       |                          | Empty = not entered                                  | 3 very important  
|       |                          | Empty = not entered                                  |
| Q10b  | R_Outcome_expectancy1.j | Over the next four months reducing joint pain is    | 1 unimportant  
|       |                          | Empty = not entered                                  | 2 important  
|       |                          | Empty = not entered                                  | 3 very important  
|       |                          | Empty = not entered                                  |
| Q11b  | R_Outcome_expectancy1.k | Over the next four months preventing/managing lymphedema is | 1 unimportant  
|       |                          | Empty = not entered                                  | 2 important  
|       |                          | Empty = not entered                                  | 3 very important  
|       |                          | Empty = not entered                                  |
| Q15a | R_task_SE1.aer.a | Please rate how confident you are that you could perform the following activities over the next 4 months:  

a. I can walk for 20 minutes without stopping | 1 Not at all confident  
2 slightly confident  
3 Moderately confident  
4 very confident  
5 extremely confident  
Empty = not entered | Tailoring N2 |
| Q15b | R_task_SE1.aer.b | Please rate how confident you are that you could perform the following activities over the next 4 months:  

b. I can jog for 10 minutes without stopping | 1 Not at all confident  
2 slightly confident  
3 Moderately confident  
4 very confident  
5 extremely confident  
Empty = not entered | Tailoring N2 |
| Q15c | R_task_SE1.aer.c | Please rate how confident you are that you could perform the following activities over the next 4 months:  

c. I can climb 3 flights of stair without stopping | 1 Not at all confident  
2 slightly confident  
3 Moderately confident  
4 very confident  
5 extremely confident  
Empty = not entered | Tailoring N2 |
| Q15d | R_task_SE1.aer.d | Please rate how confident you are that you could perform the following activities over the next 4 months:  
d. I can exercise for 20 minutes at a level hard enough to cause a large increase in heart rate and breathing | 1 Not at all confident  
2 slightly confident  
3 Moderately confident  
4 very confident  
5 extremely confident  
Empty = not entered | Tailoring N2 |
|---|---|---|---|---|
| Q15e | R_task_SE1.res.a | Please rate how confident you are that you could perform the following activities over the next 4 months:  
a. I can do 6 wall push ups in a row | 1 Not at all confident  
2 slightly confident  
3 Moderately confident  
4 very confident  
5 extremely confident  
Empty = not entered | Tailoring N2 |
| Q15f | R_task_SE1.res.b | Please rate how confident you are that you could perform the following activities over the next 4 months:  
I can do one small session of | 1 Not at all confident  
2 slightly confident  
3 Moderately confident  
4 very confident | Tailoring N2 |
<table>
<thead>
<tr>
<th>Section E</th>
<th>Q7ab</th>
<th>R_Social_support1.friends.a</th>
<th>During the past 4 months my friends</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a.</td>
<td>Exercised with me</td>
<td>1 not at all</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 Rarely</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 A few times</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 often</td>
</tr>
</tbody>
</table>

Q15g | R_task_SE1.res.c | Please rate how confident you are that you could perform the following activities over the next 4 months: I can do yoga for 60 minutes |
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not at all confident</td>
<td>2 slightly confident</td>
</tr>
<tr>
<td>3</td>
<td>Moderately confident</td>
<td>4 very confident</td>
</tr>
<tr>
<td>5</td>
<td>extremely confident</td>
<td></td>
</tr>
</tbody>
</table>

Q17a | R_behaviour_capability1.a | Please rate how much you agree with the following statements |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>I know how to warm up and cool down before/after an exercise session</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>strongly agree</td>
<td>2 disagree</td>
</tr>
<tr>
<td>3</td>
<td>neither agree nor disagree</td>
<td>4 agree</td>
</tr>
<tr>
<td>5</td>
<td>strongly agree</td>
<td></td>
</tr>
</tbody>
</table>

Tailoring N2 | Tailoring N1 | Tailoring N2 |
| Section E | R_Social_support1.friends.b | During the past 4 months my friends  
  b. Gave me encouragement to stick with my exercise program | 5 very often  
  6 n/a  
 Empty = not entered | Tailoring N2  
  

| Section E | R_Social_support1.friends.c | During the past 4 months my friends  
  c. Changed their schedule so we could exercise | 1 not at all  
  2 Rarely  
  3 A few times  
  4 often  
  5 very often  
  6 n/a  
 Empty = not entered | Tailoring N2  
  

| Section E | R_Social_support1.friends.d | During the past 4 months my | 1 not at all | Tailoring N2  
  

| Section E | R_Social_support1.friends.e | During the past 4 months my friends  
ed. Offered to exercise with me  
e. Gave me helpful reminders to exercise ("Are you going to exercise tonight") | 1 not at all  
2 Rarely  
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered | Tailoring N2 |
|---|---|---|---|---|
| Section E | R_Social_support1.friends.f | During the past 4 months my friends  
f. Planned for exercise on recreational outings | 1 not at all  
2 Rarely  
3 A few times  
4 often  
5 very often | Tailoring N2 |
| Section E | Q7gb     | R_Social_support1.friends.g | During the past 4 months my friends  
|          |          |                           | g. Discussed exercise with me           | 1 not at all  
|          |          |                           |                                           | 2 Rarely  
|          |          |                           |                                           | 3 A few times  
|          |          |                           |                                           | 4 often  
|          |          |                           |                                           | 5 very often  
|          |          |                           |                                           | 6 n/a  
|          |          |                           | Empty = not entered                      |  
|          |          |                           |                                           | Tailoring N2  
| Section E | Q7hb     | R_Social_support1.friends.h | During the past 4 months my friends  
|          |          |                           | h. Talked about how much they like to exercise | 1 not at all  
|          |          |                           |                                           | 2 Rarely  
|          |          |                           |                                           | 3 A few times  
|          |          |                           |                                           | 4 often  
|          |          |                           |                                           | 5 very often  
|          |          |                           |                                           | 6 n/a  
|          |          |                           | Empty = not entered                      |  
|          |          |                           |                                           | Tailoring N2  
| Section E | Q7ib     | R_Social_support1.friends.i | During the past 4 months my friends  
|          |          |                           | i. Helped plan activities               | 1 not at all  
|          |          |                           |                                           | 2 Rarely  
|          |          |                           |                                           | Tailoring N2  

| Section E | Q7jb   | R_Social_support1.friends.j | During the past 4 months my friends | 1 not at all  
2 Rarely   
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered |  Tailoring N2 |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>j. Asked me for ideas on how they can get more exercise</td>
<td></td>
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</tr>
</tbody>
</table>
| Section E | Q7kb   | R_Social_support1.friends.k | During the past 4 months my friends | 1 not at all  
2 Rarely   
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered |  Tailoring N2 |
|          |        |                             | k. Took over chores so I had more time to exercise |                                                |                  |
|          |        |                             |                                      |                                                |                  |
| Section E     | R_Social_support1.friends.l | During the past 4 months my friends | 1 not at all  
|              |                             | 1. Made positive comments about my physical apperance | 2 Rarely  
|              |                             |                                           | 3 A few times  
|              |                             |                                           | 4 often  
|              |                             |                                           | 5 very often  
|              |                             |                                           | 6 n/a  
|              |                             | Empty = not entered                      | Tailoring N2  
| Section E     | R_Social_support1.friends.m | During the past 4 months my friends | 1 not at all  
|              |                             | m. Got angry at me for exercising        | 2 Rarely  
|              |                             |                                           | 3 A few times  
|              |                             |                                           | 4 often  
|              |                             |                                           | 5 very often  
|              |                             |                                           | 6 n/a  
|              |                             | Empty = not entered                      | Tailoring N2  
| Section E     | R_Social_support1.friends.n | During the past 4 months my friends | 1 not at all  
|              |                             | n. Criticised or made fun               | 2 Rarely  
|              |                             |                                           | 3 A few times  
|              |                             |                                           | Tailoring N2  

<table>
<thead>
<tr>
<th>Section E</th>
<th>Q7ob</th>
<th>R_Social_support1.friends.o</th>
<th>During the past 4 months my friends</th>
<th>1 not at all</th>
<th>2 Rarely</th>
<th>3 A few times</th>
<th>4 often</th>
<th>5 very often</th>
<th>6 n/a</th>
<th>Empty = not entered</th>
<th>Tailoring N2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>o. Gave me rewards for exercising</td>
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<table>
<thead>
<tr>
<th>Section E</th>
<th>Q7aa</th>
<th>R_Social_support1.family.a</th>
<th>During the past 4 months my family</th>
<th>1 not at all</th>
<th>2 Rarely</th>
<th>3 A few times</th>
<th>4 often</th>
<th>5 very often</th>
<th>6 n/a</th>
<th>Empty = not entered</th>
<th>Tailoring N2</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>a. Exercised with me</td>
<td></td>
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<tr>
<td>Section E Q7ba</td>
<td>R_Social_support1.family.b</td>
<td>During the past 4 months my family</td>
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<td></td>
<td></td>
<td>b. Gave me encouragement to stick with my exercise program</td>
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<td></td>
<td></td>
<td>1 not at all</td>
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<td></td>
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<td>2 Rarely</td>
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<td>3 A few times</td>
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<td>4 often</td>
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<td>5 very often</td>
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<td>6 n/a</td>
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<td>Empty = not entered</td>
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<td>Tailoring N2</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section E Q7ca</th>
<th>R_Social_support1.family.c</th>
<th>During the past 4 months my family</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>c. Changed their schedule so we could exercise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 not at all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Rarely</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 A few times</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 often</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 very often</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tailoring N2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section E Q7da</th>
<th>R_Social_support1.family.d</th>
<th>During the past 4 months my family</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>d. Offered to exercise with me</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 not at all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Rarely</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 A few times</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 often</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tailoring N2</td>
</tr>
</tbody>
</table>
| Section E | R_Social_support1.family.e | During the past 4 months my family | 1 not at all  
2 Rarely  
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered | Tailoring N2 |
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q7ea</td>
<td></td>
<td>e. Gave me helpful reminders to exercise (“Are you going to exercise tonight”)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Section E | R_Social_support1.family.f | During the past 4 months my family | 1 not at all  
2 Rarely  
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered | Tailoring N2 |
| Q7fa |  | f. Planned for exercise on recreational outings |  | |
| Section E | R_Social_support1.family.g | During the past 4 months my | 1 not at all  
2 Rarely  
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered | Tailoring N2 |
| Q7ga | family | g. Discussed exercise with me | 2 Rarely  
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered |
| --- | --- | --- | --- |
| Section E | R_Social_support1.family.h | During the past 4 months my family | 1 not at all  
2 Rarely  
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered |
| Q7ha | Tailoring N2 |
| Section E | R_Social_support1.family.i | During the past 4 months my family | 1 not at all  
2 Rarely  
3 A few times  
4 often  
5 very often |
| Q7ia | Tailoring N2 | i. Helped plan activities around my exercise |
| Section E | R_Social_support1.family.j | During the past 4 months my family  
  j. Asked me for ideas on how they can get more exercise | 1 not at all  
  2 Rarely  
  3 A few times  
  4 often  
  5 very often  
  6 n/a  
  Empty = not entered | Tailoring N2  
| --- | --- | --- | --- | --- |
| Section E | R_Social_support1.family.k | During the past 4 months my family  
  k. Took over chores so I had more time to exercise | 1 not at all  
  2 Rarely  
  3 A few times  
  4 often  
  5 very often  
  6 n/a  
  Empty = not entered | Tailoring N2  
| Section E | R_Social_support1.family.l | During the past 4 months my family  
  l. Made positive | 1 not at all  
  2 Rarely | Tailoring N2  

<table>
<thead>
<tr>
<th>Section E</th>
<th>Q7ma</th>
<th>R_Social_support1.family.m</th>
<th>During the past 4 months my family</th>
<th>3 A few times  4 often  5 very often  6 n/a  Empty = not entered</th>
<th>Tailoring N2</th>
</tr>
</thead>
<tbody>
<tr>
<td>m.</td>
<td></td>
<td></td>
<td>Got angry at me for exercising</td>
<td>1 not at all  2 Rarely  3 A few times  4 often  5 very often  6 n/a  Empty = not entered</td>
<td></td>
</tr>
<tr>
<td>Section E</td>
<td>Q7na</td>
<td>R_Social_support1.family.n</td>
<td>During the past 4 months my family</td>
<td>3 A few times  4 often  5 very often  6 n/a  Empty = not entered</td>
<td>Tailoring N2</td>
</tr>
<tr>
<td>n.</td>
<td></td>
<td></td>
<td>Criticised or made fun of me for exercising</td>
<td>1 not at all  2 Rarely  3 A few times  4 often  5 very often  6 n/a</td>
<td></td>
</tr>
</tbody>
</table>
**Section E**

| Q7oa | R_Social_support1.family.o | During the past 4 months my family | 1 not at all  
2 Rarely  
3 A few times  
4 often  
5 very often  
6 n/a  
Empty = not entered |
|------|---------------------------|-----------------------------------|--------------------------------------------------|

| R_PA.Equipment1 | Please indicate which items you have in your home or yard | *more than one response allowed  
1 Aerobic equipment (exercise bike, treadmill, elliptical etc)  
2 Resistance training equipment (dumbbells, machine weights, therabands etc)  
3 Sports equipment (tennis rackets, soccer ball, roller) | Tailoring N3 |

<p>| Tailoring N2 | Tailoring N3 |</p>
<table>
<thead>
<tr>
<th>Q6b</th>
<th>R_PA_Environment1.b</th>
<th>Please rate whether or not you agree or disagree with the following statements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>a. Many shops, stores, markets or other places to buy things I need are within easy walking distance of my home</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 strongly disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 somewhat disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 neither agree nor disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 somewhat agree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 strongly agree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty = not entered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q6e</th>
<th>R_PA_Environment1.e</th>
<th>Please rate whether or not you agree or disagree with the following statements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 strongly disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 somewhat disagree</td>
</tr>
</tbody>
</table>

Tailoring N3
<table>
<thead>
<tr>
<th>Q6f</th>
<th>R_PA_Environment1.f</th>
<th>Please rate whether or not you agree or disagree with the following statements.</th>
<th>1 strongly disagree</th>
<th>Tailoring N3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>c. My neighbourhood has several free or low cost recreation facilities, such as parks, walking trails, bike paths, recreation centres, playgrounds, public swimming pools etc</td>
<td>2 somewhat disagree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 neither agree nor disagree</td>
<td>3 neither agree nor disagree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 somewhat agree</td>
<td>4 somewhat agree</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>6 strongly agree</td>
<td>6 strongly agree</td>
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<td>Empty = not entered</td>
<td>Empty = not entered</td>
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</tr>
</tbody>
</table>

**Section D** Preferences

<p>| Q12 | R_Pref_exercise_partner | Who would you to exercise with? | 1 I would prefer to exercise alone | Tailoring N2 |</p>
<table>
<thead>
<tr>
<th>Section G</th>
<th>Health</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Q3</strong></td>
<td>R_Weight1_kg</td>
<td>How much do you weigh in kilograms</td>
<td>3 characters</td>
</tr>
<tr>
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<td>Empty = not entered</td>
<td>Tailoring N2</td>
</tr>
<tr>
<td><strong>Q4</strong></td>
<td>R_height1_M</td>
<td>How tall are you in centimetres (enter in meters)</td>
<td>3 characters</td>
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<td>Empty = not entered</td>
<td>Tailoring N2</td>
</tr>
<tr>
<td><strong>Q2</strong></td>
<td>R_diability1</td>
<td>Please rate how much your physical health limits your ability to engage in regular activity</td>
<td>1 not at all limited</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty = not entered</td>
<td>Tailoring N1</td>
</tr>
</tbody>
</table>
| Q6 | R_menopause_status1 | Have you been through menopause | 1 no  
2 yes  
3 prefer not to answer  
Empty = not entered | Tailoring |
|---|---|---|---|---|
| Q7a | R_comorbidity1.a | Has a doctor ever told you that you have any of the following health conditions?  
a. Arthritis (rheumatoid and osteoarthritis)  
1 No  
2 Yes  
Empty = not entered | Tailoring N1 |
| Q7b | R_comorbidity1.b | Has a doctor ever told you that you have any of the following health conditions?  
b. Osteoporosis  
1 No  
2 Yes  
Empty = not entered | Tailoring N1 |
| Q7c | R_comorbidity1.c | Has a doctor ever told you that you have any of the following health conditions?  
c. Asthma  
1 No  
2 Yes  
Empty = not entered | Tailoring N1 |
| Q7d | R_comorbidity1.d | Has a doctor ever told you that you have any of the following health conditions?  
1 No  
2 Yes | Tailoring N1 |
| Q7e | R_comorbidity1.e | Has a doctor ever told you that you have any of the following health conditions?  
|     |                 | e. Angina | 1 No  
|     |                 |           | 2 Yes  
|     |                 |           | Empty = not entered |

| Q7f | R_comorbidity1.f | Has a doctor ever told you that you have any of the following health conditions?  
|     |                 | f. Congestive heart failure (or heart disease) | 1 No  
|     |                 |           | 2 Yes  
|     |                 |           | Empty = not entered |

| Q7g | R_comorbidity1.g | Has a doctor ever told you that you have any of the following health conditions?  
|     |                 | g. Heart attack (myocardial infarct) | 1 No  
|     |                 |           | 2 Yes  
|     |                 |           | Empty = not entered |

| Q7i | R_comorbidity1.i | Has a doctor ever told you | 1 No  
|     |                 |                           | Tailoring N1 |
| Q7k | R_comorbidity1.k | Has a doctor ever told you that you have any of the following health conditions? h. Stroke or TIA | 2 Yes  
Empty = not entered | Tailoring N1 |
|-----|-----------------|-----------------------------------------------------------------|-------------------|---------------------|
| Q7q | R_comorbidity1.q | Has a doctor ever told you that you have any of the following health conditions? i. Diabetes types 1 or 2 | 1 No  
2 Yes  
Empty = not entered | Tailoring N1 |
| Q7r | R_comorbidity1.r | Has a doctor ever told you that you have any of the following health conditions? j. Degenerative disk disease (back disease, spinal stenosis, or severe chronic back pain) | 1 No  
2 Yes  
Empty = not entered | Tailoring N1 |
| Q7s | R_comorbidity1.s | Has a doctor ever told you that you have any of the following health conditions? k. Obesity | 1 No  
Empty = not entered | Tailoring N1 |
<table>
<thead>
<tr>
<th>Question</th>
<th>Code</th>
<th>Description</th>
<th>Options</th>
<th>Tailoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q9a</td>
<td>R_fatigue1_a</td>
<td>Over the past 7 days</td>
<td>1 not at all, 2 a little bit, 3 somewhat, 4 quite a bit, 5 very much</td>
<td>Tailoring N1</td>
</tr>
<tr>
<td>Q3</td>
<td>R_type_treatment.Bca</td>
<td>What type of breast cancer treatment did you receive?</td>
<td>1 = Hormonal therapies, 2 = Chemotherapy, 3 = Radiation Therapy, 4 = Surgery, 5 = Other (please specify)</td>
<td>Tailoring N1</td>
</tr>
</tbody>
</table>

that you have any of the following health conditions?

1. Lymphedema

2 Yes
Empty = not entered
| R_updatecard1 | Did the participant return the update card | 1 = no  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>2 = yes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical activity</strong></td>
<td></td>
<td>Tailoring N2</td>
</tr>
</tbody>
</table>
| R_PA1.1update.AR.ST_Sess | Average number of sessions per week individual reported performing strenuous activity on update card 1. | 3 characters  
|              |                                            | Empty = not entered |
| R_PA1.1.update.AR.ST_Min | Average time of each session (in minutes) individual spent performing strenuous activity at time of update card 1 | 5 characters  
|              |                                            | Empty = not entered |
| R_PA1.1update.AR.Mo_Sess | Average number of sessions per week individual performed moderate activity at time of update card 1. | 3 characters  
|              |                                            | Empty = not entered |
| R_PA1.1update.AR.Mo_Min | Average time of each session (in minutes) individual spent performing moderate activity at time of update card 1 | 5 characters  
|              |                                            | Empty = not entered |
| R_PA1.1update.Res_Sess | Average number of sessions | 3 characters  
<p>|              |                                            | Tailoring N2, N3 |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_PA1.1update.Res_Exc</td>
<td>Average number of exercises performed in each session of resistance training</td>
</tr>
<tr>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td></td>
<td>Tailoring N2, N3</td>
</tr>
<tr>
<td>R_PA1.1update.Res_Reps</td>
<td>Average number of repetitions of each resistance exercise performed</td>
</tr>
<tr>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td></td>
<td>Tailoring N2, N3</td>
</tr>
<tr>
<td>R_PA1.1update.Res_Mins</td>
<td>Average number of minutes spent performing resistance-training in each</td>
</tr>
<tr>
<td></td>
<td>session at the time of update card 1</td>
</tr>
<tr>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td></td>
<td>Tailoring N2, N3</td>
</tr>
<tr>
<td>R_Sit1.1update.Trav_wd_mins</td>
<td>Average mins individual report sitting while travelling on a weekday</td>
</tr>
<tr>
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<td>Empty = not entered</td>
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<tr>
<td></td>
<td>Tailoring N2</td>
</tr>
<tr>
<td>R_Sit1.1update.Wrk_wd_mins</td>
<td>Average mins individual report sitting while at work</td>
</tr>
<tr>
<td></td>
<td>Empty = not entered</td>
</tr>
<tr>
<td></td>
<td>Tailoring N2</td>
</tr>
<tr>
<td>Column</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
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</tr>
<tr>
<td>R_Sit1.1update.TV_wd_mins</td>
<td>Average mins individual report sitting while watching TV on a weekday at the time of update card 1</td>
</tr>
<tr>
<td>R_Sit1.1update.CPU_wd_mins</td>
<td>Average mins individual report sitting while using computer at home on a weekday at the time of update card 1</td>
</tr>
<tr>
<td>R_Sit1.1update.LEIS_wd_mins</td>
<td>Average mins individual report sitting while during other leisure time on a weekday at the time of update card 1</td>
</tr>
<tr>
<td>R_Sit1.1update.Trav_we_mins</td>
<td>Average mins individual report sitting while travelling on a weekend at the time of update card 1</td>
</tr>
<tr>
<td>R_Sit1.1update.Wrk_we_mins</td>
<td>Average mins individual report sitting while at work</td>
</tr>
<tr>
<td><strong>R_Sit1.1update.TV_we_mins</strong></td>
<td>Average mins individual report sitting while watching TV on a weekend at the time of update card 1</td>
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<tr>
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<td>-------------------------------------------------------------------------------------------------</td>
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<tr>
<td><strong>R_Sit1.1update.CPU_we_mins</strong></td>
<td>Average mins individual report sitting while using computer at home on a weekend at the time of update card 1</td>
</tr>
<tr>
<td><strong>R_Sit1.1update.LEIS_we_mins</strong></td>
<td>Average mins individual report sitting while during other leisure time on a weekend at the time of update card 1</td>
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<tr>
<td><strong>Goal setting</strong></td>
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</tr>
<tr>
<td><strong>R_updatecard1_setgoal</strong></td>
<td>Did you set a physical activity goal after newsletter 1? 1 = no 2 = yes Empty = not entered</td>
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</tbody>
</table>
| R_updatecard1_metgoal | Did you meet the physical activity goal that you set? | 1 = no  
2 = yes  
Empty == not entered | Tailoring N2 |
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<thead>
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<th></th>
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<tr>
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<td><strong>UPDATE CARD 2</strong></td>
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<td>Physical activity</td>
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<td>Tailoring N3</td>
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<tr>
<td></td>
<td><strong>R_PA1.2update.AR.ST_Min</strong></td>
<td>Average time of each session (in minutes) individual spent performing strenuous activity at time of update card 2</td>
<td>3 characters</td>
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<tr>
<td></td>
<td><strong>R_PA1.2update.AR.ST_Sess</strong></td>
<td>Average number of sessions per week individual reported performing strenuous activity on update card 2</td>
<td>3 characters</td>
</tr>
<tr>
<td></td>
<td><strong>R_PA1.2update.AR.Mo_Sess</strong></td>
<td>Average number of sessions per week individual performed moderate activity at time of update card 2</td>
<td>3 characters</td>
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<tr>
<td></td>
<td><strong>R_PA1.2update.AR.Mo_Min</strong></td>
<td>Average time of each session (in minutes) individual spent performing moderate activity</td>
<td>5 characters</td>
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<td>Tailoring N3</td>
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<td>Identification</td>
<td>Description</td>
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<tr>
<td>R_PA1.2update.Res_Sess</td>
<td>Average number of sessions per week individual reported engaging in resistance training at time of update card 2</td>
<td>3</td>
<td>N3</td>
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<tr>
<td>R_PA1.2update.Res_Exc</td>
<td>Average number of exercises performed in each session of resistance training at time of update card 2</td>
<td>3</td>
<td>N3</td>
</tr>
<tr>
<td>R_PA1.2update.Res_Reps</td>
<td>Average number of repetitions of each resistance exercise performed at time of update card 2</td>
<td>3</td>
<td>N3</td>
</tr>
<tr>
<td>R_Sit1.2update.Trav_wd_mins</td>
<td>Average mins individual report sitting while travelling on a weekday at update card 2</td>
<td>5</td>
<td>N3</td>
</tr>
<tr>
<td>R_Sit1.2update.Wrk_wd_mins</td>
<td>Average mins individual report sitting while at work on a weekday at baseline.</td>
<td>5</td>
<td>N3</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Notes</td>
<td>Tailoring</td>
</tr>
<tr>
<td>------</td>
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</tr>
<tr>
<td>R_Sit1.2update.TV_wd_mins</td>
<td>Average mins individual report sitting while watching TV on a weekday at update card 2</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>R_Sit1.2update.CPU_wd_mins</td>
<td>Average mins individual report sitting while using computer at home on a weekday at update card 2</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>R_Sit1.2update.LEIS_wd_mins</td>
<td>Average mins individual report sitting while during other leisure time on a weekday at update card 2</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>R_Sit1.2update.Trav_we_mins</td>
<td>Average mins individual report sitting while travelling on a weekend at update card 2</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>R_Sit1.2update.Wrk_we_mins</td>
<td>Average mins individual report sitting while at work on a weekend at update card 2.</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>R_Sit1.2update.TV_we_mins</td>
<td>Average mins individual report sitting while watching</td>
<td>5 characters (in minutes)</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td><strong>Variable</strong></td>
<td><strong>Description</strong></td>
<td><strong>Notes</strong></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
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<tr>
<td>R_Sit1.2update.CPU_we_mins</td>
<td>Average mins individual report sitting while using computer at home on a weekend at update card 2</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>R_Sit1.2update.LEIS_we_mins</td>
<td>Average mins individual report sitting while during other leisure time on a weekend at update card 2</td>
<td>5 characters (in minutes) Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>R_updatecard2_setgoal</td>
<td>Did you set a physical activity goal after newsletter 2?</td>
<td>1 = no 2 = yes Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>R_updatecard2_metgoal.</td>
<td>Did you meet the physical activity goal that you set?</td>
<td>1 = no 2 = yes Empty = not entered</td>
<td>Tailoring N3</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>Baseline Survey</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_Age</td>
<td>Participants age</td>
<td>IF “2012” - R_DOB ≤ 30 THEN 1 ELSE IF IF “2012” - R_DOB ≤ 55 THEN 2 ELSE IF “2012” - R_DOB ≤ 56 THEN 3</td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_PA1.AR.RES.Guid</td>
<td>Whether or not participants are meeting the aerobic (conditioned) and resistance-training guidelines (de-conditioned)</td>
<td>IF (R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess &lt; 5) AND (R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min ≤ 150) AND IF R_PA1.RES_Sess &lt; 1 AND (R_PA1.RES_Ex &lt; 6 AND R_PA1.RES_Rep &lt; 6 THEN 1 ELSE IF R_PA1.RES_Sess &lt; 1</td>
<td>F_introduction1</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
</tr>
<tr>
<td>---------------</td>
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<td>----------</td>
<td>-----</td>
</tr>
<tr>
<td>resistance training (de-conditioned)</td>
<td>AND (R_PA1.RES_Ex &lt; 6 AND R_PA1.RES_Rep &lt; 6 AND R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess ≥ 5) AND (R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min ≥ 150) THEN 2 ELSE IF (R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess &lt; 5) AND (R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min ≤ 150) AND R_PA1.RES_Sess ≥ 1 AND (R_PA1.RES_Ex ≥ 6 AND R_PA1.RES_Rep ≥ 6) THEN 3 ELSE IF R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess ≥ 5) AND (R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min ≥ 150) AND R_PA1.RES_Sess ≥ 1 AND (R_PA1.RES_Ex ≥ 6 AND R_PA1.RES_Rep ≥ 6) THEN 4 ELSE (default)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Not meeting resistance-training guidelines (de-conditioned) but meeting aerobic-training guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Not meeting aerobic training guidelines but meeting resistant-training guidelines (de-conditioned)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Meeting both guidelines</td>
<td></td>
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</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>I_PA1.AR.Guid_modvig</td>
<td>Whether or not participants are meeting the aerobic guidelines of 30 minutes a day over 5 sessions at baseline (accounting for additional benefit of vigorous activity):</td>
<td>IF (R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess &lt; 5) AND (R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min ≤ 150 THEN 1 ELSE IF R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess ≥ 5) AND (R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min ≥ 150 THEN 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) Not meeting the guidelines</td>
<td></td>
<td>F_aerobicperformance1</td>
</tr>
<tr>
<td></td>
<td>(2) Meeting the guidelines</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Not meeting either</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_PA1.RES.Guid</td>
<td>Whether or not participants are meeting the resistance guidelines (upper and lower limits at baseline)</td>
<td>IF R_PA1.RES_Sess ≥ 3 AND (R_PA1.RES_Ex ≥ 10 AND R_PA1.RES_Rep ≥ 8 THEN 1 ELSE IF R_PA1.RES_Sess ≥ 1 AND (R_PA1.RES_Ex ≥ 6 AND R_PA1.RES_Rep ≥ 6 THEN 2 ELSE IF R_PA1.RES_Sess &lt; 1 AND (R_PA1.RES_Ex &lt; 6 AND R_PA1.RES_Rep &lt; 6 THEN 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) Meeting the upper-limit guidelines</td>
<td></td>
<td>F_resistanceperformance1</td>
</tr>
<tr>
<td></td>
<td>(2) Meeting the lower limit guidelines</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Not meeting either</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>--------------------------------------------------------------------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>I_PA1.AR.ST_Mod_Mins</td>
<td>Number of minutes participants engage in moderate and vigorous activity at baseline (accounting for additional benefit of vigorous by multiplying any participation in vigorous activity by 2).</td>
<td>( (R__R_PA1.AR.ST_Min \times 2 + R_PA1.AR.Mo_Min) \times (R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess) )</td>
<td>F_aerobic_graph1_mins</td>
</tr>
<tr>
<td>I_PA1.AR.ST_Mod_Sessions</td>
<td>Total number of moderate and vigorous sessions participants engaged in at baseline</td>
<td>( R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess )</td>
<td>F_aerobic_graph1_sess</td>
</tr>
<tr>
<td>I_SIT1._wd_total</td>
<td>Total number of minutes individual reported sitting in a typical week day at</td>
<td>( R_Sit1.Trav_wd_mins + R_Sit1.Wrk_wd_mins + )</td>
<td>F_sittingperformance1</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
</tr>
<tr>
<td>---------------</td>
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</tr>
<tr>
<td>baseline</td>
<td></td>
<td>R_Sit1.TV_wd_mins + R_Sit1.CPU_wd_mins + R_Sit1.LEIS_wd_mins</td>
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<tr>
<td>I_SIT1._we_total</td>
<td>Total number of minutes individual reported sitting in a typical weekend day at baseline</td>
<td>R_Sit1.Trav_we_mins + R_Sit1.Wrk_we_mins + R_Sit1.TV_we_mins + R_Sit1.CPU_we_mins + R_Sit1.LEIS_we_mins</td>
<td>F_sittingperformance1</td>
</tr>
<tr>
<td>I_Sit1_combined_total</td>
<td>Combined total for sitting during week day and weekend at baseline</td>
<td>R_Sit1.Trav_wd_mins + R_Sit1.Wrk_wd_mins + R_Sit1.TV_wd_mins + R_Sit1.CPU_wd_mins + R_Sit1.LEIS_wd_mins + R_Sit1.Trav_we_mins + R_Sit1.Wrk_we_mins</td>
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<td>Description</td>
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<td>Use</td>
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<tr>
<td>R_Sit1.TV</td>
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<td>R_Sit1.TV_we_mins + R_Sit1.CPU_we_mins + R_Sit1.LEIS_we_mins</td>
<td>1_Sit1_combined_trav</td>
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<tr>
<td>R_Sit1.CPU</td>
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<td>R_Sit1.LEIS</td>
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<td>R_Sit1.TRAV</td>
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<tr>
<td>1_Sit1combined_trav</td>
<td>Estimate of number of minutes spent in vigorous activity on a single day (baseline)</td>
<td>(R_PA1.AR.ST_Min X R_PA1.AR.ST_Sess)/7</td>
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<tr>
<td>F_sittingperformance2_graph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>I_PA1.AR.Mo_pie</td>
<td>Estimate of number of minutes spent in moderate activity on a single day (baseline)</td>
<td>(R_PA1.AR.Mo_Min X R_PA1.AR.Mo_Sess)/7</td>
<td>F_sittingperformance2_graph</td>
</tr>
<tr>
<td>I_PA1.AR.Mi_pie</td>
<td>Estimate of number of minutes spent in mild activity on a single day (baseline)</td>
<td>(R_PA1.AR.Mi_Min X R_PA1.AR.Mi_Sess)/7</td>
<td>F_sittingperformance2_graph</td>
</tr>
<tr>
<td>I_PA1.SITday_pie</td>
<td>Estimate of number of minutes spent sitting on a single day (baseline)</td>
<td>(R_Sit1.Trav_wd_mins + R_Sit1.Trav_we_mins) X 0.7 + (R_Sit1.Wrk_wd_mins + R_Sit1.Wrk_we_mins) X 0.7 + (R_Sit1.TV_wd_mins + R_Sit1.TV_we_mins) X 0.7 + (R_Sit1.CPU_wd_mins +</td>
<td>F_sittingperformance2_graph</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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<td>------------------------------------------------</td>
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</tr>
<tr>
<td>I_task_SE1.aerscale</td>
<td>Task self-efficacy rating for aerobic physical activity</td>
<td>IF (R_task_SE1.aer.a + R_task_SE1.aer.b + R_task_SE1.aer.c + R_task_SE1.aer.d) / 4 ≤ 3 THEN 1 ELSE IF (R_task_SE1.aer.a + R_task_SE1.aer.b + R_task_SE1.aer.c + R_task_SE1.aer.d) / 4 ≥ 4 THEN 2</td>
<td>F_testimonial2</td>
</tr>
<tr>
<td>I_task_SE1.resscale</td>
<td>Task self-efficacy rating for aerobic physical activity</td>
<td>IF (R_task_SE1.res.a + R_task_SE1.res.b) / 2 ≤ 3 THEN 1 ELSE IF (R_task_SE1.res.a + R_task_SE1.res.b) / 2 ≥ 4 THEN 2</td>
<td>F_testimonial2</td>
</tr>
<tr>
<td>I_Social_support1.family.m.revcod</td>
<td>Reverse code negatively weighted item so that higher scores = higher</td>
<td>IF R_Social_support1.family.m = 5 THEN 1</td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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</tbody>
</table>
| social support | During the past 4 months my family | IF R_Social_support1.family.m =4 Then 2  
IF R_Social_support1.family.m =3 Then 3  
IF R_Social_support1.family.m =2 Then 4  
IF R_Social_support1.family.m =1 Then 5 | |
| I_Social_support1.family.n.rev | Reverse code negatively weighted item so that higher scores = higher social support  
During the past 4 months my family  
Criticised or made fun of | IF R_Social_support1.family.n =5 Then 1  
IF R_Social_support1.family.n =4 Then 2  
IF R_Social_support1.family.n=3 Then 3  
IF R_Social_support1.family.n=2 | |
<table>
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<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Formulas</th>
<th>Use</th>
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</thead>
</table>
|               | me for exercising | Then 4  
(1) Very often  
(2) Often  
(3) A few time  
(4) Rarely  
Not at all  
IF R_Social_support1.family.n =1  
Then 5 | |
| I_Social_support1.friends.m.revcod | Reverse code negatively weighted item so that higher scores = higher social support  
During the past 4 months my friends q. Got angry at me for exercising  
(1) Very often  
(2) Often  
(3) A few time  
(4) Rarely | IF R_Social_support1.friends.m =5  
Then 1  
IF R_Social_support1.friends.m =4  
Then 2  
IF R_Social_support1.friends.m =3  
Then 3  
IF R_Social_support1.friends.m =2  
Then 4  
IF R_Social_support1.friends.m =1  
Then 5 | |
<table>
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<tr>
<th>Variable Name</th>
<th>Description</th>
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<th>Use</th>
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<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **I_Social_support1.friends.n.revcod** | Reverse code negatively weighted item so that higher scores = higher social support. Criticised or made fun of me for exercising. | IF R_Social_support1.friends.n=5 Then 1  
                  IF R_Social_support1.friends.n=4 Then 2  
                  IF R_Social_support1.friends.n=3 Then 3  
                  IF R_Social_support1.friends.n =2 Then 4  
                  IF R_Social_support1.friends.n=1 Then 5 |     |
<p>| <strong>I_Social_support1_scale</strong> | If the person has high or low social support from friends and family. | IF (R_Social_support1.friends.a + R_Social_support1.friends.b + R_Social_support1.friends.c |     |
|               |             | )       |     |</p>
<table>
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<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Formulas</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) High</td>
<td>R_Social_support1.friends.d + R_Social_support1.friends.e + R_Social_support1.family.a + R_Social_support1.family.b + R_Social_support1.family.c + R_Social_support1.family.d + R_Social_support1.family.e + R_Social_support1.family.f + R_Social_support1.family.g + R_Social_support1.family.h + R_Social_support1.family.i + R_Social_support1.family.j + R_Social_support1.family.k + R_Social_support1.family.l + R_Social_support1.family.o +</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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<tr>
<td>I_Social_support1.family.n.revcod + I_Social_support1.family.m.revcod )/20 = ≤2 THEN low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELSE IF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IF (R_Social_support1.friends.a + R_Social_support1.friends.b + R_Social_support1.friends.c + R_Social_support1.friends.d + R_Social_support1.family.a + R_Social_support1.family.b + R_Social_support1.family.c + R_Social_support1.family.d + R_Social_support1.family.e + R_Social_support1.family.f + R_Social_support1.family.g +</td>
<td></td>
<td></td>
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<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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<tr>
<td>R_Social_support1.family.h + R_Social_support1.family.i + R_Social_support1.family.j + R_Social_support1.family.k + R_Social_support1.family.l + R_Social_support1.family.o + I_Social_support1.family.n.revcod + I_Social_support1.family.m.revcod )/19 = &gt; 2 THEN 2</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_BMI1</td>
<td>Participants BMI at baseline (1) Normal (18.5-25) (2) Overweight (26+)</td>
<td>(R_Weight1_kg /( R_height1_M^2) = ≤ 25 THEN 1 R_Weight1_kg /( R_height1_M^2) = ≥ 26 THEN 2</td>
<td>Newsletter 2</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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</tr>
<tr>
<td><strong>Update card 1</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I_PA1.1update.AR.Guid_modvig</td>
<td>Whether or not participants are meeting the aerobic guidelines of 30 minutes a day over 5 sessions at time of update card 1 (accounting for additional benefit of vigorous activity):</td>
<td>IF (R_PA1.1update.AR.ST_Sess + R_PA1.1update.AR.Mo_Sess &lt; 5) AND R_PA1.1update.AR.ST_Min (x2) + R_PA1.1update.AR.Mo_Min ≤ 150 THEN 1 ELSE IF R_PA1.1update.AR.ST_Sess + R_PA1.1update.AR.Mo_Sess ≥ 5) AND R_PA1.1update.AR.ST_Min (x2) + R_PA1.1update.AR.Mo_Min ≥ 150 THEN 2</td>
<td>Newsletter 2</td>
</tr>
<tr>
<td>I_PA1.1update.change_sess</td>
<td>Whether or not participants have changed the number of moderate-vigorous exercise sessions they participate in since baseline (at time up update card 1)</td>
<td>IF R_PA1.1update.AR.ST_Sess + R_PA1.1update.AR.Mo_Sess – (minus) R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess = &gt; 0 THEN 1 ELSE IF R_PA1.1update.AR.ST_Sess +</td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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</tr>
<tr>
<td></td>
<td>(1) Increased number of sessions</td>
<td>R_{PA1.1.update.AR.Mo_Sess} - R_{PA1.AR.ST_Sess} + R_{PA1.AR.Mo_Sess} = &lt; 0 THEN 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) Decreased number of sessions</td>
<td>ELSE IF R_{PA1.1.update.AR.ST_Sess} + R_{PA1.1.update.AR.Mo_Sess} - R_{PA1.AR.ST_Sess} + R_{PA1.AR.Mo_Sess} = 0 THEN 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Have not changed number of sessions</td>
<td>IF ((R_{PA1.1.update.AR.ST_Min} (x2) + R_{PA1.1.update.AR.Mo_Min) X (R_{PA1.1.update.AR.ST_Sess} + R_{PA1.1.update.AR.Mo_Sess})) (minus) – ((R_{PA1.AR.ST_Min} (x2) + R_{PA1.AR.Mo_Min}) X (R_{PA1.AR.ST_Sess} + R_{PA1.AR.Mo_Sess})) = &gt; 0 THEN 1</td>
<td></td>
</tr>
<tr>
<td>I_{PA1.1.update.change_mins}</td>
<td>Whether or not participants have changed the number of moderate-vigorous minutes of exercise they participate in since baseline (at time up update card 1)</td>
<td>ELSE IF ((R_{PA1.1.update.AR.ST_Min} (x2) + R_{PA1.1.update.AR.Mo_Min) X (R_{PA1.1.update.AR.ST_Sess} + R_{PA1.1.update.AR.Mo_Sess})) (minus) – ((R_{PA1.AR.ST_Min} (x2) + R_{PA1.AR.Mo_Min}) X (R_{PA1.AR.ST_Sess} + R_{PA1.AR.Mo_Sess})) = &gt; 0 THEN 1</td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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</tr>
<tr>
<td>I_PA1.1update.AR.ST_Mod_Mins</td>
<td>Number of minutes participants engage in moderate and vigorous activity at time of update card 1 (accounting for additional benefit of vigorous by multiplying any participation in vigorous activity by 2).</td>
<td>(R_PA1.1update.AR.ST_Min (x2) + R_PA1.1update.AR.Mo_Min) X (R_PA1.1update.AR.ST_Sess + R_PA1.1update.AR.Mo_Sess)) = 0 THEN 3</td>
<td>N2</td>
</tr>
</tbody>
</table>

Additional benefit of vigorous activity: Any participation in vigorous activity is multiplied by 2.
<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Formulas</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_PA1.1.update.AR.ST_Mod_Sess</td>
<td>Number of mod-vig sessions participants participated in at the time of update card 1.</td>
<td>R_PA1.1.update.AR.ST_Sess + R_PA1.1.update.AR.Mo_Sess</td>
<td>F_aerobic_graph2_sess</td>
</tr>
<tr>
<td>I_PA1.1update_baseline.change_mins</td>
<td>Number of minutes participants have increased or decrease aerobic physical activity by since baseline at time of Newsletter 1</td>
<td>((R_PA1.1.update.AR.ST_Min (x2) + R_PA1.1.update.AR.Mo_Min) X (R_PA1.1.update.AR.ST_Sess + R_PA1.1.update.AR.Mo_Sess)) minus – ((R_PA1.AR.ST_Min (x2) + R_PA1.AR.Mo_Min) X (R_PA1.AR.ST_Sess + R_PA1.AR.Mo_Sess))</td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
<td>Use</td>
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<td>------------------------------------------</td>
</tr>
<tr>
<td>I_PA1.1update.ST_pie</td>
<td>Estimate of number of minutes spent in vigorous activity on a single day</td>
<td>( \frac{R_{PA1.1.update.AR.ST_{Min}} \times R_{PA1.1.update.AR.ST_{Sess}}}{7} )</td>
<td>F_sittingperformance2_graph</td>
</tr>
<tr>
<td>I_PA1.1update.Mo_pie</td>
<td>Estimate of number of minutes spent in moderate activity on a single day</td>
<td>( \frac{R_{PA1.1.update.AR.Mo_{Min}} \times R_{PA1.1.update.AR.Mo_{Sess}}}{7} )</td>
<td>F_sittingperformance2_graph</td>
</tr>
<tr>
<td>I_PA1.1update.Mi_pie</td>
<td>Estimate of number of minutes spent in mild activity on a single day</td>
<td>( \frac{R_{PA1.1.update.AR.Mi_{Min}} \times R_{PA1.1.update.AR.Mi_{Sess}}}{7} )</td>
<td>F_sittingperformance2_graph</td>
</tr>
<tr>
<td>I_PA1.1update.Res_pie</td>
<td>Estimate of number of minutes spent Resistance training on a single day</td>
<td>( \frac{R_{PA1.1.update.Res_{Mins}} \times R_{PA1.1.update.Res_{Sess}}}{7} )</td>
<td>F_sittingperformance2_graph</td>
</tr>
<tr>
<td>I_PA1.1update.SIT_pie</td>
<td>Estimate of number of minutes spent sitting on a day</td>
<td>( (R_{Sit1.1.update.Trav_wd_mins} + R_{Sit1.1.update.Trav_we_mins}) \times 0.7 )</td>
<td>F_sittingperformance2_graph</td>
</tr>
</tbody>
</table>

(2) Meeting the lower limit guidelines
(3) Not meeting either guidelines

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Formulas</th>
</tr>
</thead>
<tbody>
<tr>
<td>single day</td>
<td>Weighted for difference on weekend</td>
<td>+ (R_Sit1.1update.Wrk_wd_mins + R_Sit1.1update.Wrk_we_mins) X 0.7 + (R_Sit1.1update.TV_wd_mins + R_Sit1.1update.TV_we_mins) X 0.7 + (R_Sit1.1update.CPU_wd_mins + R_Sit1.1update.CPU_we_mins) X 0.7 + (R_Sit1.1update.LEIS_wd_mins + R_Sit1.1update.LEIS_we_mins) X 0.7</td>
</tr>
<tr>
<td>I_Sit1.1update_combined_total</td>
<td></td>
<td>R_Sit1.1update.Trav_wd_mins + R_Sit1.1update.Wrk_wd_mins + R_Sit1.1update.TV_wd_mins + R_Sit1.1update.CPU_wd_mins + R_Sit1.1update.LEIS_wd_mins + R_Sit1.1update.Trav_we_mins + R_Sit1.1update.Wrk_we_mins +</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>R_Sit1.1.update.TV_we_mins + R_Sit1.1.update.LEIS_we_mins + R_Sit1.1.update.CPU_we_mins</td>
</tr>
<tr>
<td>I_Sit1.1update_combined_trav</td>
<td></td>
<td>R_Sit1.1.update.Trav_wd_mins + R_Sit1.1.update.Trav_we_mins</td>
</tr>
<tr>
<td>I_Sit1.1update_combined_Wrk</td>
<td></td>
<td>R_Sit1.1.update.Wrk_wd_mins + R_Sit1.1.update.Wrk_we_mins</td>
</tr>
<tr>
<td>I_Sit1.1update_combined_TV</td>
<td></td>
<td>R_Sit1.1.update.TV_wd_mins + R_Sit1.1.update.TV_we_mins</td>
</tr>
<tr>
<td>I_Sit1.1update_combined_CPU</td>
<td></td>
<td>R_Sit1.1.update.CPU_wd_mins + R_Sit1.1.update.CPU_we_mins</td>
</tr>
<tr>
<td>Update card 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_PA1.2update.AR.Guid_modvig</td>
<td>Whether or not participants are meeting the aerobic guidelines of 30 minutes a day over 5 sessions at time of update card 1 (accounting for additional</td>
<td>IF (R_PA1.2.update.AR.ST_Sess + R_PA1.2.update.AR.Mo_Sess &lt; 5) AND R_PA1.2.update.AR.ST_Min (x2) + R_PA1.2.update.AR.Mo_Min ≤ 150 THEN 1</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
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</tr>
<tr>
<td>benefit of vigorous activity):</td>
<td></td>
<td>ELSE IF (R_{PA1.2update.AR.ST_Sess + R_{PA1.2update.AR.Mo_Sess} \geq 5}) AND (R_{PA1.2update.AR.ST_Min (x2) + R_{PA1.2update.AR.Mo_Min} \geq 150) THEN 2</td>
</tr>
<tr>
<td>1 Not meeting the guidelines</td>
<td></td>
<td>IF (((R_{PA1.2update.AR.ST_Min (x2) + R_{PA1.2update.AR.Mo_Min}) X (R_{PA1.2update.AR.ST_Sess + R_{PA1.1update.AR.Mo_Sess}) (minus) – ((R_{PA1.AR.ST_Min (x2) + R_{PA1.AR.Mo_Min}) X (R_{PA1.AR.ST_Sess + R_{PA1.AR.Mo_Sess})) = \geq 20 THEN 1</td>
</tr>
<tr>
<td>2 Meeting the guidelines</td>
<td></td>
<td>ELSE IF (((R_{PA1.2update.AR.ST_Min (x2) + R_{PA1.2update.AR.Mo_Min}) X (R_{PA1.2update.AR.ST_Sess + R_{PA1.2update.AR.Mo_Sess}) (minus) – ((R_{PA1.AR.ST_Min (x2) + R_{PA1.AR.Mo_Min}) X (R_{PA1.AR.ST_Sess + R_{PA1.AR.Mo_Sess}))</td>
</tr>
<tr>
<td>I_PA1.2update_baseline.change</td>
<td>At the time of update card 2, participants have</td>
<td>(1) Increased activity level by 20 minutes since baseline (X (R_{PA1.2update.AR.ST_Sess + R_{PA1.1update.AR.Mo_Sess}) (minus) – ((R_{PA1.AR.ST_Min (x2) + R_{PA1.AR.Mo_Min}) X (R_{PA1.AR.ST_Sess + R_{PA1.AR.Mo_Sess}))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Decreased activity level by 20 minutes since baseline (X (R_{PA1.2update.AR.ST_Sess + R_{PA1.2update.AR.Mo_Sess}) (minus) – ((R_{PA1.AR.ST_Min (x2) + R_{PA1.AR.Mo_Min}) X (R_{PA1.AR.ST_Sess + R_{PA1.AR.Mo_Sess}))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) Not changed activity level since baseline (by more or less than 20)</td>
</tr>
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<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
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</tr>
<tr>
<td>I_PA1.2update_baseline.change_mins</td>
<td>Number of minutes participants have increased or decrease physical activity by since baseline at time of</td>
<td>$\text{AR.Mo}_\text{Sess}})) = \leq -20 \text{ THEN 2}$</td>
</tr>
<tr>
<td>Variable Name</td>
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<td>Formulas</td>
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<tr>
<td>Newsletter 2</td>
<td></td>
<td>(minus) – (((R_{PA1.AR.ST_{Min}}(x2) + R_{PA1.AR.Mo_{Min}}) \times (R_{PA1.AR.ST_{Sess}} + R_{PA1.AR.Mo_{Sess}})))</td>
</tr>
<tr>
<td>I_{PA1.2update.AR.ST_Mod_Mins}</td>
<td>Number of minutes participants engage in moderate and vigorous activity at time of update card 2 (accounting for additional benefit of vigorous by multiplying any participation in vigorous activity by 2).</td>
<td>((R_{PA1.2update.AR.ST_{Min}}(x2) + R_{PA1.2update.APo_{Min}} \times (R_{PA1.2update.AR.ST_{Sess}} + R_{PA1.2update.APo_{sess}})))</td>
</tr>
<tr>
<td>I_{PA1.2update_RES.baseline.change_sess}</td>
<td>Whether participants have increased, decreased or maintained the number of resistance training sessions since baseline (from time of</td>
<td>(R_{PA1.2update.Res_{Sess}} - R_{PA1.RES_{Sess}} = &gt; 0 \ \text{THEN} \ 1) (R_{PA1.2update.Res_{Sess}} - R_{PA1.RES_{Sess}} = &lt; 0 \ \text{THEN} \ 2)</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Formulas</td>
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<td>------------------------</td>
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<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>update card 2)</td>
<td>(1) Sessions increased</td>
<td>R_PA1.2update.Res_Sess - R_PA1.RES_Sess = 0 THEN 3</td>
</tr>
<tr>
<td></td>
<td>(2) Sessions decreased</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Sessions remained the same</td>
<td></td>
</tr>
<tr>
<td>I_Sit1.2update_combined_total</td>
<td></td>
<td>R_Sit1.2update.Trav_wd_mins + R_Sit1.2update.Wrk_wd_mins + R_Sit1.2update.TV_wd_mins + R_Sit1.2update.CPU_wd_mins + R_Sit1.2update.LEIS_wd_mins R_Sit1.2update.Trav_we_mins + R_Sit1.2update.Wrk_we_mins + R_Sit1.2update.TV_we_mins + R_Sit1.2update.LEIS_we_mins +</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Formulas</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_Sit1.2update_combined_trav</td>
<td></td>
<td>R_Sit1.2update.Trav_wd_mins + R_Sit1.2update.Trav_we_mins</td>
<td>F_sittingperformance3</td>
</tr>
<tr>
<td>I_Sit1.2update_combined_Wrk</td>
<td></td>
<td>R_Sit1.2update.Wrk_wd_mins + R_Sit1.2update.Wrk_we_mins</td>
<td>F_sittingperformance3</td>
</tr>
<tr>
<td>I_Sit1.2update_combined_TV</td>
<td></td>
<td>R_Sit1.2update.TV_wd_mins + R_Sit1.2update.TV_we_mins</td>
<td>F_sittingperformance3</td>
</tr>
<tr>
<td>I_Sit1.2update_combined_CPU</td>
<td></td>
<td>R_Sit1.2update.CPU_wd_mins + R_Sit1.2update.CPU_we_mins</td>
<td>F_sittingperformance3</td>
</tr>
</tbody>
</table>

**Feedback variable table**

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Description</th>
<th>Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newsletter 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F_Introduction1</td>
<td>Which introduction is received in newsletter 1.</td>
<td>Dear “R_first.name”</td>
</tr>
</tbody>
</table>

This newsletter has been prepared especially for you, based on the information you
Micro-tailored message based on individual’s first name and whether or not they are meeting the guidelines.

Provided in the enrolment survey and the current scientific evidence about physical activity and breast cancer survivorship.

Over the next three months, the Move More for life newsletters will provide you with personalised advice and feedback about your participation in physical activity and {IF I_PA1.AR.RES.Guid = 1 THEN will offer you encouragement and support to help you include more health enhancing physical activities into your routine. ELSE IF I_PA1.AR.RES.Guid = 2 OR I_PA1.AR.RES.Guid = 3 THEN will offer you encouragement and support to include some additional kinds of health enhancing activities into your routine. I_PA1.AR.RES.Guid = 4 THEN will offer you encouragement and support to keep up the good work you are doing and optimise your exercise routine ELSE will offer you encouragement and support to help you optimize your exercise routine}.}

Read on to learn about the physical activity recommendations for cancer survivors!

We hope you enjoy reading the newsletter and encourage you to complete the activities within.

F_Recommendation1 Generic text message about the physical activity recommendations for cancer survivors Initialized 1

Newsletter 1, Page 1

F_Glossary1 Generic text message explaining physical Initialized 1
<table>
<thead>
<tr>
<th>Activity Terms</th>
<th>Feedback on participants’ participation in aerobic physical activity compared to the guidelines.</th>
<th>Initialized 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>F_Aerobic_performance1</td>
<td>IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = &lt; 3 AND R_PA.PD_AR_global = 1 THEN 1</td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = &lt; 3 AND R_PA.PD_AR_global = 2 THEN 2</td>
</tr>
<tr>
<td></td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = &lt; 3 AND R_PA.PD_AR_global = 3 THEN 3</td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 1 THEN 4</td>
</tr>
<tr>
<td></td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 2 THEN 5</td>
<td>ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND</td>
</tr>
</tbody>
</table>
R_PA.PD_AR_global = 3 THEN 6

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 1 THEN 7

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 2 THEN 8

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 3 THEN 9

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 1 THEN 10

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 2 THEN 11

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 3 THEN 12

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = < 3 AND
R_PA.PD_AR_global = 4 THEN 13

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 4 THEN 14

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = < 3 AND R_PA.PD_AR_global = 4 THEN 15

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = ≥3 AND R_PA.PD_AR_global = 4 THEN 16

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = 6 AND R_PA.PD_AR_global = 1 THEN 17

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = 6 AND R_PA.PD_AR_global = 2 THEN 18

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = 6 AND R_PA.PD_AR_global = 3 THEN 19

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND
R_PA.PD_AR_global = 1 THEN 20

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND
R_PA.PD_AR_global = 2 THEN 21

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND
R_PA.PD_AR_global = 3 THEN 22

ELSE IF I_PA1.AR.Guid_modvig = 1 AND R_diability1 = 6 AND
R_PA.PD_AR_global = 4 THEN 23

ELSE IF I_PA1.AR.Guid_modvig = 2 AND R_diability1 = 6 AND
R_PA.PD_AR_global = 4 THEN 24

ELSE

F_Aerobic_Graph1_minutes | Column graph comparing participant’s minutes of mod-vigorous participation compared to the guidelines. (With participants reported vigorous activity minutes doubled to adjust for additional benefits) | Column 1
I_PA1.AR.ST_Mod_Mins | Column 2
“150”
### F_Aerobic_Graph1_sessions

Colum graph comparing participants number of mod-vigorous exercise sessions compared to the guidelines

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_PA1.AR.ST_Mod_Sessions</td>
<td>I_PA1.AR.ST_Mod_Sessions</td>
</tr>
</tbody>
</table>

**Newsletter 1, page 1**

- Maximum value = 14
- Y axis – “number of sessions per/week”
- X Axis – column 1 “You”
- Column 2 “Recommended”

### F_Resistance_performance1

Feedback on participants’ participation in resistance-based physical activity compared to the guidelines.

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initialized 4</td>
<td></td>
</tr>
</tbody>
</table>

**IF I_PA1.RES.Guid = 1 THEN 1**

**ELSE IF I_PA1.RES.Guid = 2 THEN 2**
### F_Resistance_Graph1_sessions

- Column group: “sessions”
- Column graph comparing participants number of sessions participated in resistance-training to national guidelines.
- Newsletter 1, page 2
- R_PA1.RES_Sess (in colour x)
- “3” (In colour z)

### F_Resistance_Graph1_Exercises

- Column group: “Exercises”
- Column graph comparing participants number of exercise performed each sessions in resistance-training to national guidelines.
- Newsletter 1, page 2
- R_PA1.RES_Ex (in colour x)
- “10” (In colour z)

### F_Resistance_Graph1_Reps

- Column group: “Repetitions”
- Column graph comparing participants number of reps of each exercise performed each sessions in resistance-training to national guidelines.
- Newsletter 1, page 2
- R_PA1.RES_Rep (in colour x)
- 12 (In colour z)

### F_Sitting_performance1

- Micro-tailored message
- Newsletter 1, page 2
- There is new research to show that sitting for prolonged periods of time is associated with adverse health outcomes, independent of those attributable to a lack of physical activity*. Some research has indicated that prolonged sitting is
associated with increased risk for some cancers and with death from cancer in some women.

- If “total sitting time wkd” = ≤ 120 mins AND “total sitting time wke” = ≤120 minutes THEN Your results indicate that you do not spend much of your time in prolonged sedentary behaviours.
- ELSE IF “total sitting time wkd” = > 121 mins AND “total sitting time wke” = ≤120 minutes THEN Your results indicate that you may benefit from breaking up your sitting time during the week.
- ELSE IF If “total sitting time wkd” = ≤ 120 mins AND “total sitting time wke” = >121 minutes THEN Your results indicate that you may benefit from breaking up your sitting time over the weekend.
- ELSE IF If “total sitting time wkd” = > 121 mins AND “total sitting time wke” = > 121 minutes THEN Your results indicate that you may benefit from breaking up your sitting time during the week and over the weekend.
- ELSE How many hours did you spend sitting on a typical day last week? _____

In general, you should try and limit the amount you sit in your leisure time to 2 hours per day, and to stand up and move after 30 minutes of uninterrupted sitting**. A good way to do this is by doing some stretching or some light-moderate physical activity intermittently through-out the day. Even standing up for a few minutes can be beneficial.

There is a growing body of evidence suggesting that participating in regular physical activity may reduce the risk of your cancer coming back. One research study found that women who exercised after their diagnosis had a reduced risk of recurrence and death from breast cancer by up to half, when compared to women who were inactive after their diagnosis*. Whilst it isn’t yet clear how much or how little exercise is needed to gain survival benefits, results from the Nurses health Study* suggest that just three hours of moderate intensity activity per week is associated with increased survival.

Participating in regular physical activity can also help you improve the quality of your life. Participating in regular physical activity can help you feel good about yourself, improve your mood and combat several of the side effects associated with breast cancer and breast cancer treatments.

| IF R_Outcome_expectancy1.e ≥ 2 OR R_Outcome_expectancy1.f ≥ 2 OR R_Outcome_expectancy1.i ≥ 2 OR R_Outcome_expectancy1.j ≥ 2 OR R_Outcome_expectancy1.k ≥ 2 THEN | For example, participating in regular physical activity can**:
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>{IF R_Outcome_expectancy1.e = ≥ 2 THEN Help you control your weight, especially if you also eat well. Performing resistance-training is particularly beneficial, because it increases your muscle mass and more muscle mass means that your body burns more calories when you are at rest.}</td>
<td></td>
</tr>
<tr>
<td>IF R_Outcome_expectancy1.f = ≥ 2 THEN Help you regain lost muscle and improve your strength</td>
<td></td>
</tr>
<tr>
<td>IF R_Outcome_expectancy1.i = ≥ 2 THEN Help you manage fatigue and feel more energetic.</td>
<td></td>
</tr>
<tr>
<td>IF R_Outcome_expectancy1.j = ≥ 2 THEN Help you strengthen your</td>
<td></td>
</tr>
</tbody>
</table>
bones and may also help prevent bone loss and osteoporosis in pre-menopausal women.
- IF R_Outcome_expectancy1.k ≥ 2 THEN Be protective against lymphedema or lymphedema flare-ups)


**Schmitz & Speck (2010). Risk and benefits of physical activity among survivors who have completed treatment. Women’s Health. 6, 221-238

<table>
<thead>
<tr>
<th>F_Beingactivesafely1</th>
<th>Micro-tailored message</th>
<th><strong>Warning signs to stop exercising</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>The research evidence shows that engaging in physical activity is safe for cancer survivors. However, if you notice any of the following stop your exercise session immediately and seek medical advice.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Chest pain or pressure</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Development of irregular pulse</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Recurring leg pain or cramps</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Bone, back or neck pain of recent origin</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Tenderness in a joint that worsens with activity</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Sudden shortness of breath, muscular</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Dizziness, feeling disoriented or confused</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Known blood counts that are below normal</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Any other unusual sensation.</strong></td>
</tr>
</tbody>
</table>
Picking suitable activities

The type of activity that is suitable for you will depend on a number of factors, including any side-effects of treatment and your current health and fitness level. In general, most activities that involve large muscle groups that are performed at a moderate intensity are suitable. However, the following points should be adhered to in order to avoid injury:

- You should warm-up and cool down for 5-10 minutes before and after exercising. IF R\_behaviour\_capability1.a = ≤3 OR IF R\_behaviour\_capability1.a = empty THEN This can include 5 minutes of easy walking or cycling and an additional 5 minutes of stretching (we have included some stretches you may like to try on the activity planner included with this newsletter)
- IF R\_comorbidity1.s = 2 OR R\_comorbidity1.s = empty THEN Women with lymphedema should wear a well-fitting compression garment during resistance-training. If there is any swelling, exercise should be ceased and professional advice sort.
- AND/OR IF “R\_fatigue1\_a = ≥ 3 or R\_fatigue1\_a = empty THEN. Exercising at a vigorous intensity may exacerbate fatigue rather than improve it. Light-moderate intensity exercise is more appropriate when fatigue is an issue.
- AND/OR IF R\_comorbidity1.c = 2 OR R\_comorbidity1.d = 2 OR R\_comorbidity1.e = 2 OR R\_comorbidity1.f = 2 OR R\_comorbidity1.g = 2 OR R\_comorbidity1.i = 2 OR R\_comorbidity1.k = 2 OR R\_comorbidity1.q = 2 OR R\_comorbidity1.r = 2 THEN Given your other health issues, it would be best for you to engage in activities that are of a mild-moderate intensity. Engaging in vigorous activity may put you at risk. If you would like to engage in more vigorous activity, it would be best to build up to it over time and speak with your GP or an exercise
• AND/OR IF R_comorbidity1.a = 2 OR R_comorbidity1.b = 2 OR R_type_treatment.Bca =1 THEN It may be best to avoid activities that involve a high level of contact, such as contact sports, if bone pain or weakness is an issue. Weight bearing activities (i.e. any activity that works your bones and muscles, such as walking or weight training) can help to improve bone strength but if pain occurs some non weight bearing activities, such as swimming or cycling may be more appropriate.
• If you are feeling a bit off - don’t push yourself. Exercising at a high intensity can do you more harm than good when your immune system is low. If you are feeling sick or know that you are at an increased risk of infection, you should step it down a notch and avoid places and activities that increase your risk of infection, such as public gym facilities and swimming pools.
• Be patient and ensure that progression in intensity is gradual

If you would like help designing or re-evaluating your exercise program, consider making an appointment with an exercise physiologist or certified exercise professional that is knowledgeable about breast cancer and its treatment. If you are worried about the cost speak to your GP. You may be eligible for a Medicare rebate via an enhanced primary care plan.

<table>
<thead>
<tr>
<th>F_Actionplannin1</th>
<th>Initialised 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>F_closingmessage1</td>
<td>Initialised 1</td>
</tr>
<tr>
<td>Newsletter 2</td>
<td></td>
</tr>
<tr>
<td>F_Introduction2</td>
<td>Which introduction is received in newsletter 2</td>
</tr>
</tbody>
</table>
**Micro-tailored message** based on Individual’s first name and whether or not they returned the update card.

including expert advice about how to motivate yourself and create a supportive environment. The content of this newsletter is based on the information you provided in your initial assessment. We didn’t receive an update card from you this time. We will send you another one in a few weeks. Please fill it out to make sure you receive the most up to date feedback on your progress. **ELSE IF**

```
R_updatecard = 2 THEN
```

including feedback on your progress since the last newsletter and expert advice about how to motivate yourself and create a supportive environment. The content of this newsletter is based on the information you provided in your initial assessment and the update card you completed recently. Thank you for completing these assessments, we couldn’t provide these newsletters without it! 

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<table>
<thead>
<tr>
<th>F_Aerobic_performance2</th>
<th>Feedback on participants’ participation in aerobic physical activity compared to baseline assessment and national guidelines.</th>
<th>Initialized 32</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IF</strong> 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 1 AND 1_PA1.1update.AR.Guid_modvig = 1 AND 1_PA1.AR.Guid_modvig = 1 <strong>THEN</strong> 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELSE IF</strong> 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 1 AND 1_PA1.1update.AR.Guid_modvig = 2 AND 1_PA1.AR.Guid_modvig = 1 <strong>THEN</strong> 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELSE IF</strong> 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 1 AND 1_PA1.1update.AR.Guid_modvig = 2 AND 1_PA1.AR.Guid_modvig = 2 <strong>THEN</strong> 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELSE IF</strong> 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 2 AND 1_PA1.1update.AR.Guid_modvig = 1 AND 1_PA1.AR.Guid_modvig = 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
THEN 4

ELSE IF 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 2
AND 1_PA1.1update.AR.Guid_modvig = 1 AND 1_PA1.AR.Guid_modvig = 2
THEN 5

ELSE IF 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 2
AND 1_PA1.1update.AR.Guid_modvig = 2 AND 1_PA1.AR.Guid_modvig = 1
THEN 6

ELSE IF 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 2
AND 1_PA1.1update.AR.Guid_modvig = 2 AND 1_PA1.AR.Guid_modvig = 2
THEN 7

ELSE IF 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 3
AND 1_PA1.1update.AR.Guid_modvig = 1 AND 1_PA1.AR.Guid_modvig = 1
THEN 8 (note this message is actually the same as message 4)

ELSE IF 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 3
AND 1_PA1.1update.AR.Guid_modvig = 2 AND 1_PA1.AR.Guid_modvig = 1
THEN 9 (note this message is actually the same as message 6)

ELSE IF 1_PA1.1update.change_sess = 1 AND 1_PA1.1update.change_mins = 3 AND 1_PA1.1update.AR.Guid_modvig = 2 AND 1_PA1.AR.Guid_modvig = 2 THEN 10 (note this message is actually the same as message 7)

ELSE IF 1_PA1.1update.change_sess = 2 AND 1_PA1.1update.change_mins = 1 AND 1_PA1.1update.AR.Guid_modvig = 1 AND 1_PA1.AR.Guid_modvig = 1 THEN 11

ELSE IF 1_PA1.1update.change_sess = 2 AND 1_PA1.1update.change_mins = 1 AND 1_PA1.1update.AR.Guid_modvig = 1 AND 1_PA1.AR.Guid_modvig = 2 THEN 12

ELSE IF 1_PA1.1update.change_sess = 2 AND 1_PA1.1update.change_mins = 1 AND 1_PA1.1update.AR.Guid_modvig = 2 AND 1_PA1.AR.Guid_modvig = 1 THEN 13

ELSE IF 1_PA1.1update.change_sess = 2 AND 1_PA1.1update.change_mins = 1 AND 1_PA1.1update.AR.Guid_modvig = 2 AND 1_PA1.AR.Guid_modvig = 2 THEN 14 (note this message is actually the same as message 7)
ELSE IF $I_{PA1.1update}.change\_sess = 2$ AND $I_{PA1.1update}.change\_mins = 2$ AND $I_{PA1.1update}.AR.Guid\_modvig = 1$ AND $I_{PA1}.AR.Guid\_modvig = 1$ THEN 15

ELSE IF $I_{PA1.1update}.change\_sess = 2$ AND $I_{PA1.1update}.change\_mins = 2$ AND $I_{PA1.1update}.AR.Guid\_modvig = 2$ AND $I_{PA1}.AR.Guid\_modvig = 2$ THEN 16

ELSE IF $I_{PA1.1update}.change\_sess = 2$ AND $I_{PA1.1update}.change\_mins = 2$ AND $I_{PA1.1update}.AR.Guid\_modvig = 2$ AND $I_{PA1}.AR.Guid\_modvig = 2$ THEN 17

ELSE IF $I_{PA1.1update}.change\_sess = 2$ AND $I_{PA1.1update}.change\_mins = 3$ AND $I_{PA1.1update}.AR.Guid\_modvig = 1$ AND $I_{PA1}.AR.Guid\_modvig = 1$ THEN 18

ELSE IF $I_{PA1.1update}.change\_sess = 2$ AND $I_{PA1.1update}.change\_mins = 3$ AND $I_{PA1.1update}.AR.Guid\_modvig = 1$ AND $I_{PA1}.AR.Guid\_modvig = 2$ THEN 19

ELSE IF $I_{PA1.1update}.change\_sess = 2$ AND $I_{PA1.1update}.change\_mins = 3$ AND $I_{PA1.1update}.AR.Guid\_modvig = 1$ AND $I_{PA1}.AR.Guid\_modvig = 2$ THEN 19
AND I_PA1.1update.AR.Guid_modvig = 2 AND I_PA1.AR.Guid_modvig = 2 THEN 20 (note this message is actually the same as message 17)

ELSE IF I_PA1.1update.change_sess = 3 AND I_PA1.1update.change_mins = 1 AND I_PA1.1update.AR.Guid_modvig = 1 AND I_PA1.AR.Guid_modvig = 1 THEN 21 (note this message is actually the same as message 11)

ELSE IF I_PA1.1update.change_sess = 3 AND I_PA1.1update.change_mins = 1 AND I_PA1.1update.AR.Guid_modvig = 2 AND I_PA1.AR.Guid_modvig = 2 THEN 22 (note this message is actually the same as message 3)

ELSE IF I_PA1.1update.change_sess = 3 AND I_PA1.1update.change_mins = 2 AND I_PA1.1update.AR.Guid_modvig = 1 AND I_PA1.AR.Guid_modvig = 1 THEN 23

ELSE IF I_PA1.1update.change_sess = 3 AND I_PA1.1update.change_mins = 2 AND I_PA1.1update.AR.Guid_modvig = 1 AND I_PA1.AR.Guid_modvig = 2 THEN 24

ELSE IF I_PA1.1update.change_sess = 3 AND I_PA1.1update.change_mins = 2 AND I_PA1.1update.AR.Guid_modvig = 2 AND I_PA1.AR.Guid_modvig = 2 THEN 25 (note this message is actually the same as message 17).
ELSE IF I_PA1.1update.change_sess = 3 AND I_PA1.1update.change_mins = 3 AND I_PA1.1update.AR.Guid_modvig = 1 THEN 26

ELSE IF I_PA1.1update.change_sess = 3 AND I_PA1.1update.change_mins = 3 AND I_PA1.1update.AR.Guid_modvig = 2 THEN 27

ELSE IF I_PA1.1update.AR.Guid_modvig = 1 THEN 28 (intended for when data was missing at baseline)

ELSE IF I_PA1.1update.AR.Guid_modvig = 2 THEN 29 (intended for when data was missing at baseline)

ELSE IF I_PA1.AR.Guid_modvig = 1 THEN 30 (intended for when update card data is missing but baseline results are available)

ELSE IF I_PA1.AR.Guid_modvig = 2 THEN 31 (intended for when update card data is missing but baseline results are available)

ELSE 32 (intended for when update card data is missing and baseline data is not available)
| F_Aerobic_Graph2_minutes | Column graph comparing participant’s current minutes of mod-vigorous participation with their baseline score and the national guidelines (With participants reported vigorous activity minutes doubled to adjust for additional benefits) | Graph 1 - Minutes (max value = 500)  
Column 1.  
- I_PA1.AR.ST_Mod_Mins  
Column 2  
- I_PA1.1update.AR.ST_Mod_Mins  
Column 3  
- Recommendation = 150 minutes (non-tailored)  
Maximum value “420”  
Y axis – “mins of activity per/week”  
X Axis variable labels  
Column 1 - 2 months ago  
Column 2 – past month  
Column 3 - Recommended amount  
X Axis title: Your participation in aerobic activity |
| F_Aerobic_Graph2_sessions | Column graph comparing participants number of mod-vigorous exercise sessions compared to the guidelines | Graph 2 - Sessions (max value = 7)  
Coloumn1. |
<table>
<thead>
<tr>
<th>F_Resistance_performance2</th>
<th>Feedback on participants resistance-training based on update card 1, baseline assessment and national guidelines</th>
<th>Initialized 16</th>
</tr>
</thead>
</table>

- **I_PA1.AR.ST_Mod_Sessions**
- **I_PA1.1.update.AR.ST_Mod_Sess**
- **Recommendation** = 5 sessions (non tailored)

Maximum value = 14

Y axis – “number of sessions per/week”

X Axis variable labels

- Column 1 - 2 months ago
- Column 2 – past month
- Column 3 - Recommended amount

X Axis title: Your participation in aerobic activity

**IF** 1_PA1.RES.Guid = 1 **AND** I_PA1.1update.RES.Guid = 1 **THEN** 1

**ELSE IF** 1_PA1.RES.Guid = 1 **AND** I_PA1.1update.RES.Guid = 2 **THEN** 2

**ELSE IF** 1_PA1.RES.Guid = 1 **AND** I_PA1.1update.RES.Guid = 3 **THEN** 3

**ELSE IF** 1_PA1.RES.Guid = 2 **AND** I_PA1.1update.RES.Guid = 1 **THEN** 4
ELSE IF I_PA1.RES.Guid = 2 AND I_PA1.1update.RES.Guid = 2 THEN 5
ELSE IF I_PA1.RES.Guid = 2 AND I_PA1.1update.RES.Guid = 3 THEN 6
ELSE IF I_PA1.RES.Guid = 3 AND I_PA1.1update.RES.Guid = 1 THEN 7
ELSE IF I_PA1.RES.Guid = 3 AND I_PA1.1update.RES.Guid = 2 THEN 8
ELSE IF I_PA1.RES.Guid = 3 AND I_PA1.1update.RES.Guid = 3 THEN 9
ELSE IF I_PA1.1update.RES.Guid = 1 THEN 10 (baseline data missing)
ELSE IF I_PA1.1update.RES.Guid = 2 THEN 11 (baseline data missing)
ELSE IF I_PA1.1update.RES.Guid = 3 THEN 12 (baseline data missing)
ELSE IF I_PA1.RES.Guid = 1 THEN 13 (update card missing)
ELSE IF I_PA1.RES.Guid = 2 THEN 14 (update card missing)
ELSE IF I_PA1.RES.Guid = 3 THEN 15 (update card missing)
ELSE THEN 16 (both update card and baseline data missing).

<table>
<thead>
<tr>
<th>F_Sitting_performance2</th>
<th>Generic text message about sitting time</th>
<th>Initialized 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>F_Sitting_performance2_chart</td>
<td>Pie chart estimating persons pattern of</td>
<td>Section 1</td>
</tr>
</tbody>
</table>
activity over a single day.

Each section is based on update card 1, where this is not possible value is based on baseline data, where this is not possible a default value has been given.

Section 1

I_PA1.1update.ST_pie

ELSE I_PA1.AR.ST_pie

ELSE “0”

Section 2

I_PA1.1update.Mo_pie

ELSE I_PA1.AR.Mo_pie

ELSE “0”

Section 3

I_PA1.1update.Mi_pie

ELSE I_PA1.AR.Mi_pie
ELSE “0”

Section 4

I_PA1.1update.Res_pie

ELSE IF R_PA1.RES_Sess $\geq$ 1 THEN “30”

ELSE “0”

Section 5

I_PA1.1update.SIT_pie

ELSE I_PA1.SITday_pie

ELSE “540”

F_testimonial2  Testimonial based on participant’s task self-efficacy score (high or low), age (younger, Initialized 15
middle-age, older) and weight (healthy, over).

IF I_task_SE1.aerscale = 1 AND I_Age = 1 AND I_BMI1 = 1 THEN 1

ELSE IF I_task_SE1.aerscale = 1 AND I_Age = 1 AND I_BMI1 = 2 THEN 2

ELSE IF I_task_SE1.aerscale = 1 AND I_Age = 2 AND I_BMI1 = 1 THEN 3

ELSE IF I_task_SE1.aerscale = 1 AND I_Age = 2 AND I_BMI1 = 2 THEN 4

ELSE IF I_task_SE1.aerscale = 1 AND I_Age = 3 AND I_BMI1 = 1 THEN 5

ELSE IF I_task_SE1.aerscale = 1 AND I_Age = 3 AND I_BMI1 = 2 THEN 6

ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 1 AND I_BMI1 = 1 THEN 7

ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 1 AND I_BMI1 = 2 THEN 8

ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 2 AND I_BMI1 = 1 THEN 9
ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 2 AND I_BMI1 = 2 THEN 10

ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 3 AND I_BMI1 = 1 THEN 11

ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 3 AND I_BMI1 = 2 THEN 12

ELSE IF I_task_SE1.aerscale = 1 THEN 3

ELSE IF I_task(SE1).aerscale = 2 THEN 9

ELSE THEN 3

F_testimonial2_pic Corresponding images to testimonials in F_testimonial

IF I_task(SE1).aerscale = 1 AND I_Age = 1 AND I_BMI1 = 1 THEN IMAGE 1

ELSE IF I_task(SE1).aerscale = 1 AND I_Age = 1 AND I_BMI1 = 2 THEN IMAGE 2

ELSE IF I_task(SE1).aerscale = 1 AND I_Age = 2 AND I_BMI1 = 1 THEN IMAGE 3
<table>
<thead>
<tr>
<th>Condition</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELSE IF I_task_SE1.aerscale = 1 AND I_Age = 2 AND I_BMI1 = 2 THEN</td>
<td>IMAGE 4</td>
</tr>
<tr>
<td>ELSE IF I_task_SE1.aerscale = 1 AND I_Age = 3 AND I_BMI1 = 1 THEN</td>
<td>IMAGE 5</td>
</tr>
<tr>
<td>ELSE IF I_task_SE1.aerscale = 1 AND I_Age = 3 AND I_BMI1 = 2 THEN</td>
<td>IMAGE 6</td>
</tr>
<tr>
<td>ELSE I_task_SE1.aerscale = 2 AND I_Age = 1 AND I_BMI1 = 1 THEN</td>
<td>IMAGE 7</td>
</tr>
<tr>
<td>ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 1 AND I_BMI1 = 2 THEN</td>
<td>IMAGE 8</td>
</tr>
<tr>
<td>ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 2 AND I_BMI1 = 1 THEN</td>
<td>IMAGE 9</td>
</tr>
<tr>
<td>ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 2 AND I_BMI1 = 2 THEN</td>
<td>IMAGE 10</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 3 AND I_BMI1 = 1 THEN IMAGE 11</td>
<td></td>
</tr>
<tr>
<td>ELSE IF I_task_SE1.aerscale = 2 AND I_Age = 3 AND I_BMI1 = 2 THEN IMAGE 12</td>
<td></td>
</tr>
<tr>
<td>ELSE IF Age = 1 THEN IMAGE 1</td>
<td></td>
</tr>
<tr>
<td>ELSE IF Age = 2 THEN IMAGE 3</td>
<td></td>
</tr>
<tr>
<td>ELSE IF Age = 3 THEN IMAGE 5</td>
<td></td>
</tr>
<tr>
<td>ELSE IMAGE 3</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>F_expertadvice2</td>
<td>Expert behavior change advice from Kerry Courneya (non-tailored)</td>
<td>Initialized 1</td>
</tr>
<tr>
<td>F_Supportenv2</td>
<td>Advice about how to create a supportive environment for physical activity</td>
<td>IF I_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 1 THEN 1</td>
</tr>
</tbody>
</table>
Tailored based on individuals social support score

(Items a-e on the friend scale and all items on family scale)

And on individuals exercise partner preference

Default value is low social support with no preference

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF I_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 2</td>
<td>2</td>
</tr>
<tr>
<td>IF I_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 3</td>
<td>3</td>
</tr>
<tr>
<td>IF I_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 4</td>
<td>4</td>
</tr>
<tr>
<td>IF I_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = 5</td>
<td>5</td>
</tr>
<tr>
<td>IF I_Social_support1_scale = 1 AND IF R_Pref_exercise_partner = empty</td>
<td>6</td>
</tr>
<tr>
<td>IF I_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 1</td>
<td>7</td>
</tr>
<tr>
<td>IF I_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 2</td>
<td>8</td>
</tr>
<tr>
<td>IF I_Social_support1_scale = 2 AND IF R_Pref_exercise_partner = 3</td>
<td>9</td>
</tr>
<tr>
<td>F_Actionplanning2</td>
<td>Tailored message blocks based on whether or not participant set goal.</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>F_Aerobic_performance3</td>
<td>Tailored message blocks providing feedback on individual’s aerobic physical activity</td>
</tr>
<tr>
<td>F_Introduction3</td>
<td>Which introduction is received in newsletter 3</td>
</tr>
<tr>
<td>Newsletter 3</td>
<td>Initialized 1</td>
</tr>
<tr>
<td>F_closingmessage2</td>
<td>ELSE Message 4</td>
</tr>
</tbody>
</table>
behavior over the past three months.

Feedback based on whether or not participants have increased or decreased their activity by a significant amount (20 minutes a week) and whether or not they are currently meeting the guidelines.

```
ELSE IF I_PA1.2update_baseline.change = 1 AND IF I_PA1.2update.AR.Guid_modvig = 2 THEN MESSAGE 2 (MICROT: "I_PA1.2update_baseline.change_ mins")

ELSE IF I_PA1.2update_baseline.change = 2 AND IF I_PA1.2update.AR.Guid_modvig = 1 THEN MESSAGE 3
  "(MICROT:I_PA1.2update_baseline.change_ mins"

ELSE IF I_PA1.2update_baseline.change = 2 AND IF I_PA1.2update.AR.Guid_modvig = 2 THEN MESSAGE 4
  "I_PA1.2update_baseline.change_ mins"

ELSE IF I_PA1.2update_baseline.change = 3 AND IF I_PA1.2update.AR.Guid_modvig = 1 THEN MESSAGE 5

ELSE IF I_PA1.2update_baseline.change = 3 AND IF I_PA1.2update.AR.Guid_modvig = 2 THEN MESSAGE 6

ELSE IF I_PA1.1update.change_mins = 1 AND IF I_PA1.1update.AR.Guid_modvig = 1 THEN MESSAGE 7 (MICROT: "I_PA1.1update_baseline.change_ mins")

ELSE IF I_PA1.1update.change_mins = 1 AND IF I_PA1.1update.AR.Guid_modvig = 2 THEN MESSAGE 8 (MICROT:I_PA1.1update_baseline.change_ mins"

ELSE IF I_PA1.1update.change_mins = 2 AND IF I_PA1.1update.AR.Guid_modvig = 1 THEN MESSAGE 9
  "(MICROT:I_PA1.1update_baseline.change_ mins")
```
<table>
<thead>
<tr>
<th><strong>F_aerobic_graph3_mins</strong></th>
<th><strong>Column graph of estimated minutes of mod-vigorous (accounting for extra benefits of vigorous activity by multiplying it by 2) activity over the past three months.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Based on self-reported aerobic PA at baseline, update card 1 and updated card 2.</td>
</tr>
</tbody>
</table>

**Graph (**

*Column Graph – Average Minutes of activity (max value = 500)*

Column1.

- I_PA1.AR.ST_Mod_Mins

Column 2

- I_PA1.1update.AR.ST_Mod_Mins

Column 3

- I_PA1.2update.AR.ST_Mod_Mins

ELSE IF I_PA1.1update.change_mins = 2 AND I_PA1.1update.AR.Guid_modvig = 2 THEN MESSAGE 10 (MICROT:1_PA1.1update_baseline.change_mins)’

ELSE IF I_PA1.1update.change_mins = 3 AND I_PA1.1update.AR.Guid_modvig = 1 THEN MESSAGE 11

ELSE IF I_PA1.1update.change_mins = 3 AND I_PA1.1update.AR.Guid_modvig = 2 THEN MESSAGE 12

ELSE IF I_PA1.AR.Guid_modvig = 1 THEN MESSAGE 13

ELSE IF I_PA1.AR Guid_modvig = 2 THEN MESSAGE 14

ELSE THEN MESSAGE 15
**X axis variable labels:**

Column 1 (I_PA1.AR.ST_Mod_Mins) 3 months ago

Column 2 (I_PA1.1update.AR.ST_Mod_Mins) 2 months ago

Column 3 (I_PA1.1update.AR.ST_Mod_Mins) Past month

**X axis title:** Your participation in aerobic activity

**Y axis – “mins of activity per/week”**

*Note: Your reported scores for moderate and vigorous activities were used to formulate this graph (with the number of minutes participated in vigorous activity doubled to account for additional benefits of doing vigorous activity).*

<table>
<thead>
<tr>
<th>F_Resistance_performance3</th>
<th>Initialized 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF R_PA1.2update.Res_Sess = ≥ 3 AND I_PA1.2update_RES.baseline.change_sess = 1 THEN 1</td>
<td></td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = ≥ 3 AND I_PA1.2update_RES.baseline.change_sess = 2 THEN 2</td>
<td></td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = ≥ 3 AND I_PA1.2update_RES.baseline.change_sess = 3 THEN 3</td>
<td></td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = ≥ 1 AND I_PA1.2update_RES.baseline.change_sess = 1 THEN 4</td>
<td></td>
</tr>
<tr>
<td>ELSE IF R_PA1.2update.Res_Sess = ≥ 1 AND</td>
<td></td>
</tr>
<tr>
<td>F_Resistance_performance_Graph sess</td>
<td>Column 1.</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>• R_PA1.RES_Sess</td>
</tr>
<tr>
<td></td>
<td>Column 2</td>
</tr>
<tr>
<td></td>
<td>• R_PA1.1update.Res_Sess</td>
</tr>
<tr>
<td></td>
<td>Column 3</td>
</tr>
</tbody>
</table>

```
I_PA1.2update_RES.baseline.change_sess = 2 THEN 5
ELSE IF R_PA1.2update.Res_Sess ≥ 1 AND I_PA1.2update_RES.baseline.change_sess = 3 THEN 6
ELSE IF R_PA1.2update.Res_Sess = 0 AND I_PA1.2update_RES.baseline.change_sess = 2 THEN 7
ELSE IF R_PA1.2update.Res_Sess = 0 AND I_PA1.2update_RES.baseline.change_sess = 3 THEN 8
ELSE IF R_PA1.1update.Res_Sess ≥ 3 THEN 9
ELSE IF R_PA1.1update.Res_Sess ≥ 1 THEN 10
ELSE IF R_PA1.1update.Res_Sess = 0 THEN 11
ELSE IF R_PA1.Res_Sess ≥ 3 THEN 12
ELSE IF R_PA1.Res_Sess = 1 THEN 13
ELSE IF R_PA1.Res_Sess ≥ 0 THEN 14
ELSE THEN 15
```
<table>
<thead>
<tr>
<th>F_Resistance_performance_Graph Exc</th>
<th>Column 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• R_PA1.RES_Ex</td>
</tr>
<tr>
<td></td>
<td>Column 2</td>
</tr>
<tr>
<td></td>
<td>• R_PA1.1update.Res_Exc</td>
</tr>
<tr>
<td></td>
<td>Column 3</td>
</tr>
<tr>
<td></td>
<td>• R_PA1.2update.Res_Exc</td>
</tr>
<tr>
<td>X axis variable labels:</td>
<td></td>
</tr>
<tr>
<td>• Column 1-3 months ago</td>
<td></td>
</tr>
<tr>
<td>• Column 2-2 months ago</td>
<td></td>
</tr>
<tr>
<td>• Column 3-Last month</td>
<td></td>
</tr>
<tr>
<td>Y axis – Number of exercises per week</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F_Resistance_performance_Graph reps</th>
<th>Column 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• R_PA1.RES_Rep</td>
</tr>
</tbody>
</table>
Data will need to be entered in terms of minutes.

There are 7 message blocks but each message contains programming language to specify which tips are given.

F_sitting_performance3

<table>
<thead>
<tr>
<th>Column 2</th>
<th>Column 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_PA1.1update.Res_Reps</td>
<td></td>
</tr>
<tr>
<td>R_PA1.2update.Res_Reps</td>
<td></td>
</tr>
</tbody>
</table>

X axis variable labels:

- Column 1 - 3 months ago
- Column 2 - 2 months ago
- Column 3 - Last month

Y axis – Number of repetitions of each exercise per week

IF 1_Sit1.update_combined_total = ≥ 480 then message intro 1
ELSE IF 1_Sit1.update_combined_total = < 480 then message intro 2
ELSE IF 1_Sit1.1update_combined_total ≥ 480 THEN message intro 3
ELSE IF 1_Sit1.1update_combined_total < 480 THEN message intro 4
ELSE IF 1_Sit1_combined_total ≥ 480 THEN message intro 5
ELSE IF 1_Sit1_combined_total < 480 THEN message intro 6
ELSE THEN 7

Tailored tips within each message are micro-tailored based on the following intermediate variables when the score = ≥ 60 9 IF SCORE < 60 – no tip given).
<table>
<thead>
<tr>
<th>F_SUPPENV3</th>
<th>Micro-tailored message</th>
<th>Making physical activity a part of your lifestyle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With exception of tip based on</td>
<td>In the last newsletter we suggested some strategies to help you manage your</td>
</tr>
</tbody>
</table>
A tailored tip is given for a particular response and if that response is not given then no message is given.

participation in physical activity and to make sure that you have the support that you need from your friends and family. These strategies are very important and can help keep you motivated. This next section is about strategies you can use to help make physical activity a bigger part of your day-to-day life.

Our top tips

1. Look for opportunities to be active throughout the day
   - Take the stairs instead of the lift
   - When you drive somewhere, don’t try and find the closest park you can
   - IF \( R_{Work1} = 1 \) or \( R_{Work1} = 2 \) THEN Go for a walk in your lunch break at work
   - IF \( R_{EQUIP1} = 5 \) AND \( R_{PA\_Environment1.e} \geq 3 \) THEN Ride your bike instead of driving
   - IF \( R_{PA\_Environment1.b} \geq 3 \) THEN Walk to the shops when you only need a few things

2. Create a supportive home environment
   - IF \( R_{PA\_Environment1.f} \leq 2 \) THEN Think about what you can do to make your home more exercise friendly. For example, you could put a mat down to stretch on, expand your exercise library by investing in some equipment (e.g. clothes, DVDs, Dumbbells) and use prompts around the house (e.g. a post-it note next to the fridge or the TV) reminding you of your goals.
   - ELSE IF \( R_{PA\_Environment1.f} \geq 3 \) THEN Think about what you can do to make your home more exercise friendly. For example, you could put a mat down to stretch on or move some furniture around so that you have more space to do your exercises. You could make a list of all the places near your home that would be a nice place to walk to or exercise at and keep the list on your fridge as a reminder.
   - IF \( R_{PA\_Equipment1} = 1 \) OR IF \( R_{PA\_Equipment1} = 2 \) IF you can,
keep your exercise equipment somewhere visible in your home (such as in the lounge room). If you have a separate room for your equipment, do what you can to make the space feel nice.

3. Restructure your time
   - Get up half an hour earlier or go to bed half an hour later
   - Combine exercise with other activities (e.g. stretching while watching TV; walk while catching up with a friend)

<table>
<thead>
<tr>
<th>F_expertadvice3</th>
<th>Generic message and image.</th>
<th>Initialized 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>F_further_information3</td>
<td>Contact information/ Links to where participants can find further information tailored based on internet access and state.</td>
<td>Initialized 10</td>
</tr>
</tbody>
</table>

**IF**  
R_internet.home1 = 2 OR **IF** R_internet.work1 = 2 and R_state = WA THEN 1

ELSE IF R_internet.home1 = 2 OR **IF** R_internet.work1 = 2 and R_state = NSW THEN 2

ELSE IF R_internet.home1 = 2 OR **IF** R_internet.work1 = 2 and R_state = VIC THEN 3

ELSE IF R_internet.home1 = 2 OR **IF** R_internet.work1 = 2 and R_state = TAS THEN 4
ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = NT THEN 5

ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = SA THEN 6

ELSE IF IR_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = ACT THEN 7

ELSE IF R_internet.home1 = 2 OR IF R_internet.work1 = 2 and R_state = QLD THEN 8

ELSE IF R_internet.home1 = 1 OR IF R_internet.work1 = 1 THEN 9

ELSE THEN 9

F_Actionplanning3 | Tailored message blocks based on whether or not participant set goal. | Initialised 14

IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 2 AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 2 THEN 1
ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 2 AND
IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 1 THEN 2

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 2 AND
IF R_updatecard2_setgoal = 1 THEN 3

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 1 IF
R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 2 THEN 4

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 1 IF
R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 1 THEN 5

ELSE IF R_updatecard1_setgoal = 2 AND IF R_updatecard1_metgoal = 1 IF
R_updatecard2_setgoal = 1 THEN 6

IF R_updatecard1_setgoal = 1 AND IF R_updatecard2_setgoal = 2 AND IF
R_updatecard2_metgoal = 2 THEN 7

IF R_updatecard1_setgoal = 1 AND IF R_updatecard2_setgoal = 2 AND IF
<table>
<thead>
<tr>
<th>F_closingmessage3</th>
<th>Closing message for newsletter 3. Reinforcing key messages and wishing them the best.</th>
<th>R_updatecard2_metgoal = 1 THEN 8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IF R_updatecard1_setgoal = 1 AND IF R_updatecard2_setgoal = 1 THEN 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IF R_updatecard1_setgoal = empty AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 2 THEN 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IF R_updatecard1_setgoal = empty AND IF R_updatecard2_setgoal = 2 AND IF R_updatecard2_metgoal = 1 THEN 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IF R_updatecard1_setgoal = empty AND IF R_updatecard2_setgoal = 1 THEN 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IF R_updatecard1_setgoal = empty AND IF R_updatecard2_setgoal = empty THEN 9</td>
<td></td>
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<td></td>
<td>ELSE THEN 9</td>
<td></td>
</tr>
</tbody>
</table>

Initialised 1
Appendix 4.6: Statements of contribution from co-authors
Statement of contribution

I, Erica I. James, attest that Research Higher Degree candidate Camille E Short contributed substantially - in terms of study concept and design, and preparation of the manuscript - to the publication:


16 April 2013

A/Prof. Erica I. James (Co-author) Date

Camille E Short (Candidate) Date

(Assistant Dean Research Training) Date
Statement of contribution

I, Ronald C Plotnikoff, attest that Research Higher Degree candidate Camille E Short contributed substantially- in terms of study concept and design, literature searching and analysis, and preparation of the manuscript-to the publication:


Prof Ronald C Plotnikoff (Co-author)                                      21/02/12                      Date

Camille E Short (Candidate)                                      24/14/13                      Date

(Assistant Dean Research Training)                                         3/5/13                      Date
Appendix 5

All documents in this Appendix relate to the manuscript presented in chapter 6 of volume 1:

‘Move More for Life: The protocol for a randomised efficacy trial of a tailored-print physical activity intervention for post-treatment breast cancer survivors’
Appendix 5.1 Published Manuscript

Move more for life: the protocol for a randomised efficacy trial of a tailored-print physical activity intervention for post-treatment breast cancer survivors

Camille E Short1*, Erica L James1, Afaf Girgis2, Patrick Mcelduff3 and Ronald C Plotnikoff4

Abstract

Background: Due to early detection and advances in treatment, the number of women surviving breast cancer is increasing. Whilst there are many positive aspects of improved survival, breast cancer survival is associated with many long-term health and psychosocial sequelae. Engaging in regular physical activity post-diagnosis can reduce this burden. Despite this evidence, the majority of breast cancer survivors do not engage in regular physical activity. The challenge is to provide breast cancer survivors with appealing and effective physical activity support in a sustainable and cost-effective way. This article describes the protocol for the Move More for Life Study, which aims to assess the relative efficacy of two promising theory-based, print interventions designed to promote regular physical activity amongst breast cancer survivors.

Method and design: Breast cancer survivors were recruited from across Australia. Participants will be randomised into one of three groups: (1) A tailored-print intervention group, (2) a targeted-print intervention group, or (3) a standard recommendation control group. Participants in the tailored-print intervention group will receive 3 tailored newsletters in the mail over a three month period. Participants in the targeted-print group will receive a previously developed physical activity guidebook designed specifically for breast cancer survivors immediately after baseline. Participants in the standard recommendation control will receive a brochure detailing the physical activity guidelines for Australian adults. All participants will be assessed at baseline, and at 4 and 10 months post-baseline. Intervention efficacy for changing the primary outcomes (mins/wk aerobic physical activity; sessions/exercises per week resistance physical activity) and secondary outcomes (steps per day, health-related quality life, compliance with physical activity guidelines, fatigue) will be assessed. Mediation and moderation analyses will also be conducted.

Discussion: Given the growing number of cancer survivors, distance-based behaviour change programs addressing physical activity have the potential to make a significant public health impact.

Trial registration: Australian New Zealand Clinical Trials Registry (ANZCTR) identifier: ACTRN12611001061921
Background

Due to earlier detection and advances in treatment, more and more women are surviving breast cancer each year [1]. Whilst improved survival is duly welcomed, breast cancer survivors are faced with both short and long-term health and psychosocial sequelae [2], including fatigue, reductions in physical and cognitive functioning, reductions in bone health, lymphedema, weight gain and mood disturbances [3-6]. Compared to the general (non-cancer) population, breast cancer survivors are at an increased risk of co-morbid chronic conditions and death from both cancer and non-cancer causes [7]. As such, there is a growing need for effective cancer recovery services that can help to improve the quality of life of breast cancer survivors and negate the associated health burdens and risks [8].

One promising cancer recovery strategy is the promotion of regular physical activity (PA) [9,10]. Evidence from health outcome trials suggests that regular PA can address both the psychological and physiological burdens presented after breast cancer diagnosis and treatment [11,12]. Furthermore, observational research suggests that regular PA may also have an impact on survival, with breast cancer survivors who are active after treatment having a lower risk of cancer recurrence, co-morbidities and death from all causes compared to those who are less active, regardless of cancer stage [13-15]. In recognition of these benefits, detailed exercise prescription guidelines for cancer survivors have been published by professional bodies in both Australia and North America [9,10,16].

There is also new evidence that addressing the pattern of activity is important, with unique metabolic consequences associated with prolonged sedentary behaviour, regardless of total activity time [15,17]. Despite this evidence, the majority of breast cancer survivors are not sufficiently active for health [17,18] and efforts to encourage regular PA and reductions in sitting time are not a routine part of the cancer treatment or rehabilitation process [19-22].

Whilst over 70 PA intervention studies have been conducted with cancer survivors, the majority have been atheoretical face-to-face programs conducted during the treatment phase [23-26]. Whilst these interventions have been efficacious in improving important outcomes for cancer survivors, there is a need for more sustainable, less resource intensive approaches that can support survivors beyond the initial treatment phase [27-29]. Such programs should be grounded in behaviour change theory, and address the unique determinants of PA adoption and maintenance in the post-treatment breast cancer population [30,31].

The purpose of this study is to evaluate the relative efficacy of two promising distance-based approaches (targeted and tailored print interventions) for promoting PA among post-treatment breast cancer survivors compared to a standard recommendation control group. In targeted-print interventions, irrelevant information is reduced by providing individuals with materials targeted to a particular subgroup they belong to (e.g., breast cancer survivors) [32]. In tailored-print interventions, computer technology is utilised to provide individuals with personalised advice based on information specific to them (derived from individual assessment) [32]. Both approaches have been put forth as low-cost, evidence-based alternatives to resource intensive face-to-face programs [32,33], but little information exists about the relative efficacy and the cost/benefit of these approaches in the physical activity domain.

Some theories of information processing, such as The Elaboration Likelihood Model [34], suggest that people are more likely to process information in a way that is conducive to behaviour change, if it is personally relevant to them. Based on this model, we hypothesise that individuals randomised into either the targeted or tailored print groups will experience significantly greater improvements at each time-point on all primary and secondary outcomes compared to the standard recommendation control group. Furthermore, given the greater level of personalisation of materials in the tailored-print condition, we expect participants in the tailored-print group to experience greater improvements across PA outcomes compared to participants in the targeted-print group. This hypothesis relies on the assumption that breast cancer survivors are a somewhat heterogeneous group in terms of determinants (i.e., demographics, social-cognitive and ecological factors) of PA behaviour change.

Methods

Design

This study is a nationally-based, three-arm randomised controlled trial (RCT), testing the relative efficacy of two distance-based PA interventions (tailored and targeted print) compared to a standard recommendation control group. Participants will complete data collection at baseline, 4 months and 10 months. Ethics approval was obtained from the University of Newcastle Human Research Ethics Committee (H-2010-11-3). The RE-AIM framework [35] will serve to guide the dissemination of this program in terms of adoption, implementation and maintenance. The conduct and reporting of this study will adhere to the Consolidating Standards of Reporting Clinical Trials (CONSORT) guidelines [36] and to the Reporting Standards for Studies of Tailored Interventions [37]. The study flow chart is presented in Figure 1 (note: recruitment for this study is complete).

Participants

Selection criteria

Female breast cancer survivors who are over the age of 18 and who have finished “active” cancer treatment (defined as surgery, chemotherapy and/or radiotherapy), who can...
read and write in English were eligible to participate in the study. All potential participants were required to complete a physical activity readiness questionnaire (PAR-Q; [38]), to screen participants and identify those requiring review from their doctor prior to study enrolment.

**Recruitment**

Participants were recruited using convenience sampling methods from a range of sources across Australia. Specifically, this involved (1) asking organisations (e.g., The Breast Cancer Network Australia, The Cancer Council,
YWCA Encore) and health professionals (e.g., breast care nurses) with direct contact with breast cancer survivors to disseminate information about the study on behalf of the research team; (2) promoting the study at events potentially relevant to eligible participants (e.g., breast cancer forums); and (3) snowballing recruitment (inviting participants to pass on study information to potentially eligible friends and acquaintances).

**Randomisation**
The randomisation sequence will be generated by a statistician (PM) using SAS 9.2 statistical software. An equal number of participants will be randomised to each group (1:1:1) using a randomised block design, with a block size of six, to ensure the study groups are balanced [39,40]. Participants, identified only by their ID number, will be randomised by an administrative staff member into groups upon receipt of their baseline survey. All project team members will be blinded to this process and participant details will remain de-identified until participant allocation is completed. Participant blinding is not possible due to the difference in delivery schedule of the two interventions.

**Statistical power and sample size**
The study's primary analysis will be the comparison of self-reported PA behaviour (i.e. mins/week of aerobic exercise and sessions/week of resistance training) between the three groups, from baseline to the 4 month time-point. Assuming a small-moderate correlation ($r = 0.4$) between baseline and post-intervention, to detect a mean difference of 0.5 standard deviation between study groups (small-medium effect size) for the main dependent outcome (i.e., PA behaviour) at post-intervention [41] the required sample size is 100 participants per group, allowing for a 20% loss to follow-up ($power = 0.80; \alpha = 0.01$). An alpha of 0.01 was used to adjust for multiple comparisons.

As a secondary consideration, we also ensured that this sample size would be adequate to detect a clinically significant change in step counts per day (2000 steps per day [42], standard deviation of 3500 [43]) and found that we would be adequately powered to detect meaningful changes in both self-report and objective PA outcomes.

**Outcomes**
A pen-and-paper questionnaire is completed at baseline, 4 months post baseline (immediate post-tailored intervention follow-up), and 10 months post-baseline (7 month post-tailored-intervention follow-up). At each of these time-points, participants will be asked to wear a pedometer for seven days and complete a step count diary.

**Primary outcome**
The primary outcome variables, minutes of PA (aerobic) per week and average number of sessions/exercises per week (resistance) will be assessed using an adapted version [44] of the validated Godin Leisure-Time Exercise Questionnaire (GLTEQ) [45]. The adapted version will incorporate a resistance training (RT) measure [44,46] that asks participants to report the frequency (times per week) and duration (average times per session) of resistance training activities on average over the past month. The original measure has been found to be both reliable and valid [47].

**Secondary outcomes**

**Step counts** Average daily step counts [48] will be estimated based on at least three days of pedometry, which is sufficient to reliably estimate pedometer-determined PA [49,50]. Participants will be instructed to zero the pedometer and record their accumulated steps at the end of each day for seven days, using the step count diary provided. The step count diary will also be used to record instances where the pedometer was intentionally removed (e.g. swimming) or when the participant forget to wear the device. Where reported, step count equivalents for non-ambulatory activities (e.g. swimming, cycling) will be calculated and added to the step count total using the method outlined by Miller et al. [51].

**Adherence to PA guidelines** PA type, frequency and duration measured by 8 items from the adapted version of the GLTEQ [44,46] will be used to calculate whether or not participants are meeting the PA guidelines for cancer survivors [10].

**Sedentary behaviour** Sedentary behaviour is measured using a validated five item scale asking about time spent sitting (hours and minutes) each day during the week and on the weekend in the following situations (a) while travelling to and from places; (b) while at work; (c) while watching television; (d) while using a computer from home; and (e) in leisure time not including watching television (e.g. visiting friends, dining out) [52].

**Health related quality of life** Quality of life is measured using version 4 of the internationally validated 37-item FACT-Breast measurement system (FACT-B) [53]. The FACT-B is multidimensional, consisting of subscales measuring cancer specific aspects of physical well-being, emotional well-being, social well-being, functional well-being, and 10-items measuring breast cancer specific concerns.
Fatigue Fatigue is measured using the validated 13-item FACIT (Functional Assessment of Chronic Illness Therapy) Fatigue scale, which assesses self-reported tiredness, weakness and difficulty conducting usual activities [54].

Social cognitive mediators of physical activity Hypothesized social cognitive mediators of PA behaviour are assessed using previously published, validated instruments where possible. Some items were adapted to make them more appropriate for use in this study. The adaptations were based on our own qualitative research and formative research in the field (e.g. [55]) and were tested for face validity using a small convenience sample (n = 5) of post-treatment breast cancer survivors. In each survey, the time referent used for the items is framed based on the timing of the proceeding follow-up survey (i.e. the baseline survey time referent is “the past/next four months” and the four and ten month follow-up surveys time referent is “the past/next six months”).

Outcome expectations Outcome expectations is measured using 5 general items from the validated exercise pro subscale [56] with 6 additional items developed for this study based on formative research among breast cancer survivors [55,57], including our own qualitative research and information provided by experts in the field. The items in the scale assess the extent that individuals agree or disagree (1 = strongly disagree to 5 = strongly agree) that participating in regular PA over the next 4 month would for them: reduce tension or manage stress; increase confidence about one’s health; help to sleep better; have a more positive outlook; help control weight; regain lost strength; prevent a cancer recurrence; be enjoyable; increase fatigue; increase joint pain or result in lymphoedema. An example item includes “Over the next four months, participating in regular PA will help me prevent a cancer recurrence.”

Outcome expectancies Outcome expectancies will be assessed by asking participants to rate how important each of the outcome expectations are to them (e.g. “For me, reducing joint pain is”) on a 3-point scale (1 = unimportant; 2 important; 3 very important). This scale has been utilised and tested in prior research [44,58].

Self efficacy Task self-efficacy will be assessed using 4-items developed [57] and evaluated [59] in previous studies with breast cancer survivors and 3 additional items developed for this study to assess task-self efficacy for resistance training activities. The items assess the participant’s level of confidence (1 = not at all confident to 5 = extremely confident) that over the next 4 months they can: walk for 20 minutes without stopping; jog for 10 minutes without stopping; climb 3 flights of stairs; exercise for 20 minutes at a level hard enough to cause an increase in heart rate; do 6 wall push ups in a row; do one small session of resistance training including 6 different exercises; and do yoga for 60 minutes (Example item: “Over the next four months, I can do 6 wall push ups in a row”).

Barrier self-efficacy will be assessed using 12-items based on previous scales used in chronic disease populations (7 items developed and tested by Rogers’ et al. [59] among breast cancer survivors and 5 items developed and tested by Plotnikoff et al. among diabetes patients [56,60]) and one item (“when I can’t notice any improvements in my body”) developed for this study based on formative research. Participants will be asked to rate their confidence (1 = not at all confident to 5 = extremely confident) that they can participate in regular PA over the next four months when: they lack the discipline to exercise; exercise is not a priority; the weather is bad; feeling tired; lack time; do not enjoy exercising; do not have someone to encourage them to exercise; in a bad mood or feeling depressed; have to do it alone; can’t notice any improvements in fitness; can’t notice any improvements in body; feel stiff and sore; and feel ill.

Behavioural capability Behavioural capability is measured using 6-items assessing specific components of PA knowledge and skill that were developed for this study. Participants will be asked to rate on a 5-point likert scale (1 = strongly disagree to 5 = strongly agree) how much they agree with each of the statements: I know how to warm up and cool down before/after an exercise session; I have a good idea of what type of PA to do to gain health benefits; I have a good idea of how hard I should engage in PA to gain health benefits; I have a good idea of how much PA I should do to gain health benefits; I have the skills I need to engage in aerobic physical activities; and I have the skills I need to engage in resistance-based physical activities.

Environment Social support is assessed using the 15-item social support for exercise habits scale [61]. Participants are asked to rate how often during the past four months their friends and family (separately) supported them/discouraged them to exercise in a variety of ways. Response options range from 1 (none) to 5 (very often). An example item is: “During the past four months, my friends gave me encouragement to stick with my exercise program”. The perceived built environment will be assessed using an adapted version of the 7-item IPAQ environmental module [62]. Participants will be asked to rate how much they agree or disagree (1 = strongly disagree to 5 = strongly agree) with the following statements: most of the houses in my neighbourhood are detached houses; many shops, stores, markets or other places to buy things I need are within easy walking distance of my home; my
home is within a 10–15 minute walk to a bus or train station; there are footpaths on most of the streets in my neighbourhood; there are facilities to bicycle in or near my neighbourhood; my neighbourhood has several free or low cost recreation facilities; and the crime rate in my neighbourhood makes it unsafe to go on walks at night.

**Self control and performance**  
*Self-regulation* will be assessed using a 12-item scale developed for use among older adults [63]. The items measure six subscales of self-regulation (self-monitoring, goal setting, eliciting social support, reinforcements, time management, relapse prevention) and can be combined to produce an overall score [63]. An example item is “Over the past 4 months, how often did you rearrange your schedule to ensure you had time for physical activity”. Response options range from 1 (never) to 5 (very often).

*Action planning* will be assessed using 4-items developed by Rise et al. [64] and adapted by Rhodes et al. [65] (to say “physical activity” instead of “exercise”). Participants will be asked to rate the following statements according to their plans over the next two weeks (1 = no plans to 5 detailed plans): I have made plans concerning ‘when’ I am going to engage in regular PA; I have made plans concerning ‘where’ I am going to engage in regular PA; I have made plans concerning ‘what’ kind of regular PA I will engage in; I have made plans concerning ‘how’ I am going to get to a place to engage in regular PA.

**Socio-demographics**  
The following socio-demographic data will be collected: date of birth, marital status, parental status, living arrangement, country of birth, education, employment, income, internet access, health insurance status and geographical location.

**Health status and cancer history**  
At baseline and each follow-up time point (where applicable), participants are asked five questions about their health status (physical limitations, perceived weight, menopause status, co-morbidities) and nine questions about their cancer diagnosis (age at diagnosis, cancer stage, treatment type, and prognosis).

**Process evaluation**  
Participant evaluation of the intervention materials will be measured using 15 multiple choice items and one open-ended question, included in the immediate post intervention follow-up questionnaire. The 15 multiple choice items were purpose-designed by the research team and are based on the Elaboration Likelihood Model (ELM) [34], which is often utilised to explain the effects of health communication interventions. An example item includes: “how personally relevant was the health information you received” (1 = not at all relevant to 5 = very relevant). The open ended question provides participants with a chance to make comments about the intervention materials.

**Procedure**  
Potential participants were asked to contact the project co-ordinator to express their interest in participating in the study. Potential participants were then provided with an information statement and a consent form and asked to return it to the project team within two weeks. Information was resent at two weeks if no response was received.

Participants will be asked to complete a pen-and-paper questionnaire, wear a pedometer for seven days and complete a pen-and-paper step count diary at baseline, four and ten months from baseline (Figure 1). Participants will be instructed to return the pedometer with the written materials using a reply paid envelope as soon as possible after each assessment period is complete. Participants who do not return the baseline questionnaire, and step count diary and pedometer within two weeks will receive one reminder call from the project co-ordinator. Participants who do not return the assessment materials within three weeks after this reminder call will be excluded from the trial.

Upon receipt of the baseline questionnaire, an administrative assistant will allocate participants using the ID number written on the questionnaire into one of three groups using the randomly generated allocation sequence provided by the statistician. Participants will be sent intervention or standard recommendation materials within three weeks of allocation.

Participants in the tailored-print intervention group will be sent additional intervention materials at 6 weeks and 12 weeks post baseline and update cards (3-item update card), 4 weeks and 8 weeks post base-line and asked to return them to the research team using a reply paid envelope within 7 days. Participants in the standard recommendation group will receive one tailored newsletter and a pdf version of the targeted guidebook after completion of the 10 month follow-up survey (Figure 1).

**Interventions**  
*Targeted-print intervention* Participants randomised into this group will receive a copy of a theory-based exercise guidebook developed specifically for promoting physical activity among breast cancer survivors. This guidebook was developed for use and evaluated in a previous study [66] and has been described in detail elsewhere [67]. We made minor changes to the guidebook to adapt it to an Australian audience (e.g. substituting photos and text relating to snow).
**Tailored-print intervention** Participants randomised into this group will be mailed three Social Cognitive Theory-based [68,69] computer-tailored newsletters over a 12 week period (6 weeks apart). Each newsletter will be four A4 pages in length and will provide advice and feedback unique to the individual that relates to key determinants of PA adoption and maintenance among breast cancer survivors (as stipulated by previous research in the field [57,70-77] and Social Cognitive Theory [68,78]). The advice participants receive will be tailored using information derived from individual assessments at baseline, and “update cards” (assessing PA and goal setting behaviour over the last month) sent to participants (in this group only) at 4 weeks and 8 weeks post-baseline. In each case, participants will be mailed the tailored-newsletters within two weeks after the completed assessment is received (see Figure 1).

**Newsletter 1 (N1)** will include information on the Australian PA guidelines for cancer survivors (non-tailored), tailored feedback on PA behaviour (aerobic, resistance and sitting time) relative to the guidelines, information about the beneficial outcomes of PA, safety advice and an action planning activity. An activity planner and exercise illustrations (stretches and resistance training exercises) will also be included.

**Newsletter 2 (N2)** will include expert advice from a behaviour change expert (non-tailored), feedback on PA performance (aerobic, resistance and sitting time) relative to N1, a testimonial illustrating success, advice on eliciting social support and an action planning activity.

**Newsletter 3 (N3)** will include expert advice from an exercise physiologist (non-tailored), tailored feedback on PA performance (aerobic, resistance and sitting time) relative to N2 and N1, advice on restructuring the physical environment, information about available support services and an action planning activity. See Additional file 1 (Table S1) for a brief overview of how Social Cognitive Theory was operationalised to form these intervention strategies and what variables were used to tailor information.

The tailored-print intervention was developed specifically for this study by following the eight-step procedure outlined by Kreuter et al. [79]. More information is available upon request to the corresponding author and will be available in a separate manuscript.

**Standard recommendation control group** Participants randomised into this condition will receive the “An active way to better health” brochure published by the Australian government, detailing the national physical activity guidelines for adults [80]. The guidelines stipulate that Australian adults should: (1) think of movement as an opportunity; (2) be active every day in as many ways as you can; (3) do 30 minutes of moderate intensity physical activity on most, preferably all days; and (4) if manageable, do vigorous activity for extra health benefit. A copy of the brochure can be downloaded free of charge from www.healthyactive.gov.au.

**Statistical analysis** Analyses will be conducted according to the intention to treat principal, as outlined by White et al. [81]. Namely, the primary analysis will be conducted using all observed data (i.e., a completers analysis) and sensitivity analyses (accounting for all randomised participants) will be conducted to explore the impact of missing data [81]. Differences between treatment groups in the primary outcome measures (i.e. the two PA scores) 4 months after randomisation will be tested using Analysis of Covariance (ANCOVA). The outcome in the model will be the subjects physical activity score at 4 months and the predictors will be treatment group and baseline value of the physical activity score. In the analysis of each of the two PA measures, if the p-value for the treatment group is less than 0.025 (adjusted to account for the two primary PA analyses) then post hoc tests of the 3 pair wise comparisons will be undertaken to determine which treatment groups are different. Socio-cognitive and QOL measures will also be analysed using ANCOVA models. The study’s primary analysis will be the comparison of PA behaviour between the three groups, from baseline to the 4 month time-point. Secondary analyses will examine the PA behaviour change between the study groups across the other study time-point (i.e., 10 months). A mediation analysis on the employed social-cognitive variables will also be conducted to explore the causal mechanism of any intervention effects. Planned subgroup analyses include age, PA status at baseline, time since treatment, BMI, built environment, and co-morbidity status.

**Discussion** This study will test the relative efficacy of two theory-based PA behaviour change interventions. In doing so, this study will address a seminal research question in distance-based PA behaviour change interventions. In doing so, this study will be one of the first to promote a pattern of PA that addresses the metabolic consequences of unbroken sedentary behaviours and the advantages of completing both aerobic and resistance-training exercises. The limitations reported in previous research will be addressed by examining adherence after the intervention period and by utilising an objective measure of PA behaviour (i.e., pedometers). Finally, this study will add to the behaviour change literature by addressing the paucity of knowledge surrounding determinants of PA behaviour change among
cancer survivors and potential mediators of intervention effects.

Additional file

Additional file 1: Table S1. Operationalisation of SCT constructs for the Move More for Life intervention.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
ELJ and CES conceived the study, CES, AG and RCP obtained the funding. All authors provided input into the study design. CES was primarily responsible for intervention design and recruitment, with significant input from ELJ and RCP. CES, ELJ and RCP were responsible for drafting the manuscript. PM provided statistical guidance and support and drafted the statistical analyses section of the manuscript. All authors critically evaluated the article for content and approved the final version.

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References


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Appendix 5.2 Physical activity readiness questionnaire
Dear participant,

Enclosed is a copy of the Physical Activity Readiness Questionnaire (PAR-Q) and instructions on how to correctly complete the form. It is very important that you follow the directions outlined below before consenting to participate in the Move More for Life study.

Please read through the PAR-Q form. The PAR-Q will tell you if you need to speak with your doctor before you begin physical activity.

- Please answer each question honestly by marking either YES or NO. Common sense is your best guide when you answer these questions.

- If you answer “yes” to any of the questions, you will need to check with your doctor before you can consent to participate in the Move More for Life Study. We suggest that you tell your doctor about your answers to the PAR-Q and ask about how much and what types of activities are safe for you to do.

- If you are over 69 years of age and are not used to being very active, you must also check with your doctor about participating in this study, even if you answered “no” to all of the PAR-Q questions.

- If you are under 69 years of age and answered “no” to all of the PAR-Q questions then you are eligible to participate without discussing your PAR-Q answers with your doctor. Please note that if your health changes so that you answer “Yes” to any of the questions, we require that you consult your doctor and contact the research team so that we can ensure the information we provide you with is appropriate.

- Please ensure that you have carefully read through the study information sheet and consent form before consenting to participate in the Move More for Life study.

If you have any questions please feel free to contact Camille Short (Project Coordinator) or myself, by telephone: 1800 447 208 (freecall) or Email: CHeRP-movemoreforlife@newcastle.edu.au

Yours sincerely

Associate Professor Erica James
Project Supervisor

The Research Team
A/Prof Erica James, University of Newcastle
Prof Ron Plotnikoff, University of Newcastle
Ms Camille Short (Research Student & Project Coordinator), Priority Research Centre for Health Behaviour, University of Newcastle

Complaints about this research This project has been approved by the University’s Human Research Ethics Committee, Approval No. H-2010-1103. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au
PAR-Q & YOU
(A Questionnaire for People Aged 15 to 69)

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

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

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

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

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

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

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

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

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

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Supported by: Health Canada Santé Canada
Appendix 5.3 Information statement
INFORMATION STATEMENT FOR THE RESEARCH PROJECT:
Move More for Life: A tailored physical activity program for Australian breast cancer survivors
Version 5; dated 01/08/11

We would like to invite you to participate in the “Move More for Life” Project which is being conducted by researchers from the University of Newcastle. The research is part of Ms Camille Short’s studies at the University of Newcastle, supervised by Associate Professor Erica James and Professor Ron Plotnikoff.

Why is the research being done?
Engaging in regular physical activity can have many benefits for breast cancer survivors. The reason we are doing this research is to find out whether the provision of physical activity resources is an effective strategy for improving the physical activity behaviours of breast cancer survivors.

Who can participate in the research?
Women aged over 18 who have ever been diagnosed with breast cancer and who are not currently undergoing ‘active’ cancer treatment (surgery, chemotherapy, radiotherapy), are invited to take part in the project. For the purpose of this study, women who are taking hormones following surgery or other treatments are considered eligible (ie, this is not considered to be an ‘active treatment’). If you are not sure if you are eligible, please call us to discuss. It doesn’t matter if you are already physically active or if you do not intend on changing your physical activity behaviour, you are still welcome to participate. Please note that all participants will be required to complete the physical activity readiness questionnaire, included in this pack, before they can consent to participate in the study.

What choice do you have?
Participation in this research is entirely your choice. Only those people who give their informed consent will be included in the project. Whether or not you decide to participate, your decision will not disadvantage you, or affect your medical care, or your relationship with (INSERT NAME OF ORGANISATION), in any way. If you do decide to participate, you may withdraw from the project at any time without giving a reason and have the option of withdrawing any data which identifies you.

What would you be asked to do?
To sign up for the study you will need to complete and return the consent form to the research team via email or post. Consenting participants will be randomly allocated into one of three groups: a sequential resource group (receive resources over time), a simultaneous resource group (receive resources all at once) or a delayed resource group (receive resources at the end of the trial). Participants allocated to the sequential group will receive 3 newsletters designed to address their barriers to physical activity and their current physical activity status. Participants in this group will be required to fill out two short update cards, which will be used to inform the content of the newsletters they receive. Participants allocated to the simultaneous group will receive an exercise guide for breast cancer survivors that includes information on how to begin an exercise program. Participants in the delayed resource group will not receive any materials during the study period but can elect to receive one tailored-newsletter (based on their prior assessments) and/or a pdf version of the booklet after the study is completed. At three times throughout the project (over approximately 10 months), all participants will be asked to wear a step counter, and record one week of step counts, and complete a pen and paper survey (including questions on physical activity levels). The step-counter will be sent to participants before the study commences. Regardless of what study condition you are in, it will be entirely up to you whether or not you choose to partake in any physical activity.
**How much time will it take?**
Participants will receive a pen and paper survey up to three times over approximately 10 months, which will take approximately 30 minutes to complete at each time. Wearing a step counter will not take additional time.

**What are the risks and benefits of participating?**
There is a risk of slight muscle stiffness or soreness after engaging in physical activity, especially for individuals resuming activity after a period of being sedentary. Instructions on what kinds of activities are safe to participate in will be given to reduce this risk.

In order to better understand your physical activity patterns and needs we will be asking you some questions about your cancer diagnosis and physical capabilities. In general, the questions we ask should not be upsetting. However, if by chance you are concerned by any questions, you can choose only to answer those questions you are comfortable with. The study facilitators will also be available via telephone to discuss any questions or concerns with you; and if you wish, you will also be able to contact the Cancer Council Helpline on 131120. This is a free and confidential telephone support service staffed by experienced cancer health professionals. You will also be able to withdraw from the study at anytime, without giving a reason.

There is good evidence to show that participating in regular physical activity has many benefits. For example, it can help reduce feelings of fatigue and reduce negative emotions. To help participants in this study become more physically active, all participants will be given access to the project materials, which includes a pedometer (step counter) and written materials that offer physical activity advice. The materials will be based on current physical activity guidelines for cancer survivors and will encourage participants to engage in physical activity at a pace appropriate to their ability.

Participants will also be informed about other support, resources, and services that may be able to assist participants in making healthy lifestyle changes.

**How will your privacy be protected?**
Any information collected by the researchers which might identify you will be stored securely and only accessed by the researchers. Data will be retained for at least 5 years at the University of Newcastle, within the School of Medicine and Public Health. Identifying names will be replaced by a numeric code.

**How will the information collected be used?**
For participants in the sequential condition, some of the information we collect will be used to provide you with advice and feedback about your physical activity behaviour. The goal of this advice and feedback is to help motivate you to begin physical activity and to support you in doing so.

Non-identifiable results will be reported as part of Ms Short’s studies. Findings will be published in peer-reviewed journals, presented at academic conferences, promoted via media channels and the Cancer Council NSW.

Participants will receive a study newsletter at the completion of the study. The newsletter will contain a summary of the results of the study and additional resources for maintaining healthy physical activity.

**What do you need to do to participate?**
Please read this Information Statement and be sure you understand its contents before you consent to participate.

If you would like to participate please read and complete the attached consent form and email it to us at ChERP-movemoreforlife@newcastle.edu.au or post it using the reply paid envelop provided within the next 14 days. Once your consent form is received you will then be sent a pen and paper survey, a physical activity diary and a step counter.

**Further information**
If you would like to know more about this project or have any questions please feel free to contact Camille Short (Project Coordinator) or myself, by telephone: 1800 447 208 (freecall) or Email: CHeRP-movemoreforldvice@newcastle.edu.au

This information sheet is for you to keep. Thank you for considering this invitation.

Yours sincerely

Associate Professor Erica James
Project Supervisor, School of Medicine and Public Health

The Research Team
A/Prof Erica James, Priority Research Centre for Health Behaviour, University of Newcastle
Prof Ron Plotnikoff, University of Newcastle, Priority Research Centre for Physical Activity and Nutrition
Ms Camille Short (Research Student & Project Coordinator), Priority Research Centre for Health Behaviour, University of Newcastle

Complaints about this research This project has been approved by the University’s Human Research Ethics Committee, Approval No. H-2010-1103. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au
Appendix 5.4 Consent form
Consent form for the research project:

Move More for Life: A tailored physical activity program for Australian breast cancer survivors

Version 5, 01-08-11
Researchers: Erica James, Ron Plotnikoff, Camille Short

Please TICK ONE BOX to indicate if you would like to take part in the study and return this form in the reply paid envelope or by email to CHeRP-movemoreforlife@newcastle.edu.au

☐ I agree to participate in the above research project and give my consent freely.

I understand that the research will be conducted as described in the information statement, a copy of which I have retained.

I understand I can withdraw from the project at any time without giving any reason for withdrawing.

I consent to

- Participating in the evaluation of physical activity resources, where I will receive either a series of newsletters, a physical activity booklet or one newsletter addressing my physical activity behaviour at the end of the study;
- Completing a pen and paper survey up to 3 times;
- Completing a short form (update card) up to 2 times;
- Wearing a step counter and recording my step counts for one week at a time, up to 3 times;
- Completing a readiness for physical activity questionnaire and discussing any issues with my GP before beginning the program.

I understand that my personal information will remain confidential and accessible only to the researchers.

I have had the opportunity to have questions answered to my satisfaction.

I understand that by writing my name below and returning this form I consent to participate in the above research project

Name: ………………………………………………Date……………………………..

Telephone number:………………………………………………………………

Address ………………………………………………………………………………

…………………………………………………………………………………………

Please provide details of how you found out about the Move More for Life Project?

…………………………………………………………………………………………
Appendix 5.5 Baseline Survey
Move More for Life Study
Baseline Questionnaire

Move More for Life Study
Priority Research Centre for Health Behaviour
University of Newcastle, NSW
Phone: 1800 447 208 (freecall)
Email: CHeRP-movemoreforlife@newcastle.edu.au
Thank you

Thank you for agreeing to be involved in the Move More for Life study. Your participation is greatly appreciated. By completing this confidential questionnaire, you are providing us with valuable information that we can use to support breast cancer survivors in the future.

Completing this questionnaire will take approximately 35 minutes.

Instructions

1. Please read the questions carefully and answer each one according to what is true for you. There are no right or wrong answers to any of these questions.

2. Please answer every question to the best of your ability and please do not skip any questions unless you are instructed to do so.

3. Most questions are multiple choice questions. To answer, circle the response option that best suits you. In some cases, you may be permitted to circle more than one response.

Here is an example of how to answer a multiple choice question (where you may select a single response).

I enjoy swimming. (please circle a response)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Neither agree nor disagree</td>
<td>Agree</td>
<td>Strongly agree</td>
<td></td>
</tr>
</tbody>
</table>

4. If you make a mistake, either erase or place an “X” through the incorrect answer and circle the correct response.

5. Some questions will be open-ended. To answer these questions please write your answer in the space provided.

6. When you have completed all sections of the survey, please put the survey in the reply-paid envelope provided and post it back asap within the next 7 days. No postage stamp is needed.

7. If you have any questions while completing this questionnaire please do not hesitate to contact Camille Short (Project Manager) by telephone on (freecall) 1800 447 208 or by email: CHeRP-movemoreforlife@newcastle.edu.au

Thank you for your time.

We hope you enjoy participating in the Move More for Life study.
1. What is your date of birth? _______________ (dd/mm/yyyy)

2. What is your current marital status? *(please circle a response)*
   1. Married, de facto, living with partner
   2. Separated or divorced
   3. Widowed
   4. Never married or single
   5. Prefer not to answer

3. What is the highest level of education that you have completed? *(please circle a response)*
   1. Primary school
   2. Secondary School
   3. Certificate or Diploma
   4. Undergraduate University degree
   5. Post graduate University degree
   6. Prefer not to answer

4. Which of the following best describes your current primary employment situation? *(please circle a response)*
   1. Paid full-time employment (min 35 hrs per week)
   2. Paid part-time employment (less than 35 hrs per week)
   3. Casual employment
   4. Self-employed
   5. Student
   6. Retired
   7. Household duties
   8. Volunteer
   9. Unemployed/looking for work
   10. On leave with pay
   11. On leave without pay
   10. Other *(please specify)* ______________________________
   11. Prefer not to answer

5. Has your work situation changed as a result of your cancer diagnosis or treatment (eg. work less hours, retired etc) *(please circle a response)*
1. No
2. Yes — please describe how your work situation has changed as a result of cancer:

6. What is your present gross family income each week (that is, before tax)? (please circle a response):
   1. Less than $300 per week
   2. Between $300- $499 per week
   3. Between $500- $799 per week
   4. Between $800- $1000 per week
   5. More than $1000 per week
   6. Prefer not to answer

7. Do you have children? (please circle a response):
   1. No (skip to question 9)
   2. Yes (please answer the questions below):

   How many children do you have? 1 2 3 4 5+
   How many of your children are under 18 years old? 1 2 3 4 5+

8. Do you have grandchildren?
   1. No
   2. Yes

9. Who do you live with? (please circle all that apply)
   1. No one, I live alone
   2. My partner
   3. My Children
   4. Friends
   5. One or both of my parents/my partner’s parents
   6. Other family members
   7. Other (please describe) ________________________________

10. What kind of area do you currently live in? (please circle a response)
    1. Remote
    2. Regional
    3. Major city
11. Where were you born? (please circle a response)
   1       Australia
   2       Other country (please specify): ______________

12. Is English your first language? (please circle a response)
   1      No (please specify): ______________
   2      Yes

13. Do you currently have private health insurance? (please circle a response)
   1      No – Medicare only
   2      Yes – Hospital cover only
   2      Yes – Extras cover only
   4      Yes – Hospital and extras cover

14. Do you have access to the internet at home?
   1      No
   2      Yes

15. Do you have access to the internet at work?
   1      No
   2      Yes
   3      I do not work

16. How many hours per week do you typically spend using the internet in your leisure time?
   1      0
   2      1-2 hours
   3      3-4 hours
   4      5-6 hours
   5      7+ hours
1. How old were you when you were first diagnosed with breast cancer?

   [Space for response] Years old

2. What stage of breast cancer were you diagnosed with?: *(please circle one response)*

   1. Stage 0
   2. Stage 1
   3. Stage 2
   4. Stage 3
   5. Stage 4
   6. I do not know

3. What type of breast cancer treatment did you receive? *(please circle all that apply)*

   1. Hormonal therapies
   2. Chemotherapy
   3. Radiation Therapy
   4. Surgery
   5. Other *(please specify)* _____________

4. How long has it been since you completed your active treatment for breast cancer (i.e. surgery, chemotherapy, radiotherapy)?

   [Space for response] Months   [Space for response] Years

5. Are you still on any treatments?

   1. No
   2. Yes *(Please specify)*

6. Was breast cancer your first cancer diagnosis?

   1. No
   2. Yes *(skip to question 9)*

7. What kind of cancer were you first diagnosed with?

   1. Colorectal
2 Melanoma
3 Lung
4 Non-Hodgkin’s Lymphoma
5 Head and Neck
6 Leukaemia
7 Other type (Please specify)

8. How old were you when you were first diagnosed with cancer?

__________ years old

9. At present, has your doctor told you that the cancer has: (please circle one response)

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Come back after it was treated (that is, recurrent)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Spread to other parts of your body (that is, metastatic)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Thank you for taking the time to answer these personal questions. If answering any of these questions has raised any concerns for you, you may like to consider discussing your concerns with your doctor or contacting the cancer council helpline on 13 11 20. The cancer council helpline is a free, confidential telephone information and support services that is run by specially trained staff.
For this question, we would like you to recall your average weekly participation in physical activity over the past month for strenuous, moderate, and mild physical activity.

When considering these questions please:

- Write the average amount of times per week in the first column and the average length of time in the second column.
- Only count physical activity sessions that lasted 10 minutes or longer in duration.
- Only count physical activity that was done during your free time (i.e. do not count physical activity that was done as part of your employment or household chores).
- DO NOT LEAVE ANY PART BLANK! If you did not participate in any of the following activities, please enter the number “0”.

1. On average over the past month, how many times per week did you do the following kinds of physical activity during your free time?

<table>
<thead>
<tr>
<th>Times per week</th>
<th>Average time per session (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRENUOUS PHYSICAL ACTIVITY (HEART BEATS RAPIDLY, SWEATING) (e.g., running, jogging, hockey, soccer, squash, cross country, skiing, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes)</td>
<td></td>
</tr>
<tr>
<td>MODERATE PHYSICAL ACTIVITY (NOT EXHAUSING, LIGHT PERSPIRATION) (e.g., fast walking – like you are late for an appointment, easy bicycling, easy swimming, popular and folk dancing)</td>
<td></td>
</tr>
<tr>
<td>MILD PHYSICAL ACTIVITY (MINIMAL EFFORT, NO PERSPIRATION) (e.g., easy walking, yoga, archery, fishing, bowling, lawn bowling, golf)</td>
<td></td>
</tr>
</tbody>
</table>
2. Considering your average participation over the past month indicate in the first box how many times per week you engaged in resistance (strength) training, if any. In the next box indicate the average number of different types of exercises you did and how many repetitions for each exercise.

<table>
<thead>
<tr>
<th>Times per week</th>
<th>Average number of exercises and reps</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESISTANCE TRAINING (LIFTING, PUSHING, PULLING, CONTROLLED LOWERING). (e.g. using machine weights, free weights, body weight, therabands)</td>
<td></td>
</tr>
<tr>
<td>Example only: I did push ups, sit ups and leg curls three times this week. I did 5 repetitions of each exercise</td>
<td>3</td>
</tr>
</tbody>
</table>

3. Is the amount of activity you did in the past month (including aerobic and resistance-training) more, or about the same as your usual physical activity habits? (please circle a response).

   1. less active than usual
   2. Same as usual
   3. More active than usual

4. In the past month, have you experienced any of the following problems due to engaging in physical activity?

<table>
<thead>
<tr>
<th>Problem</th>
<th>Not at all</th>
<th>A little</th>
<th>Some what</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle stiffness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Exercise related injury</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Trouble breathing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Feeling dizzy after exercising</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Severe pains in my chest during exercise</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
5. Please estimate how many hours you spend SITTING EACH DAY in the following situations:

<table>
<thead>
<tr>
<th></th>
<th>On a WEEK day</th>
<th>On a WEEKEND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours</td>
<td>Minutes</td>
</tr>
<tr>
<td>While travelling to and from places</td>
<td></td>
<td></td>
</tr>
<tr>
<td>While at work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>While watching television</td>
<td></td>
<td></td>
</tr>
<tr>
<td>While using a computer at home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In your leisure time, NOT including television (e.g. visiting friends, movies, dining out)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The next questions are about your participation in physical activity before you were diagnosed with breast cancer.

6. Has the amount of aerobic exercise you do changed since you were diagnosed with cancer?

   1. No, I do the same amount of aerobic exercise now
   2. Yes, I do more aerobic exercise now
   3. Yes, I do less aerobic exercise now

7. Has the amount of resistance exercise you do changed since you were diagnosed with cancer?

   1. No, I do the same amount of resistance exercise now
   2. Yes, I do more resistance exercise now
   3. Yes, I do less resistance exercise now

Now might be a good time to have a break and have a cuppa!
## Section D
These questions are about how you feel and think about physical activity. Please answer each question in relation to the **next 4 months**. Please circle your response.

### Over the next four months:

1a. Participating in regular physical activity will help me reduce tension or manage stress

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>strongly disagree</td>
<td>disagree</td>
<td>neither agree nor disagree</td>
<td>agree</td>
<td>strongly agree</td>
</tr>
</tbody>
</table>

1b. For me, reducing tension or managing stress is:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unimportant</td>
<td>Important</td>
<td>very important</td>
</tr>
</tbody>
</table>

2a. Participating in regular physical activity will make me more confident about my health

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<tr>
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<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>strongly disagree</td>
<td>disagree</td>
<td>neither agree nor disagree</td>
<td>agree</td>
<td>strongly agree</td>
</tr>
</tbody>
</table>

2b. For me, feeling more confident about my health is:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unimportant</td>
<td>Important</td>
<td>very important</td>
</tr>
</tbody>
</table>

3a. Participating in regular physical activity will help me sleep better

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>strongly disagree</td>
<td>disagree</td>
<td>neither agree nor disagree</td>
<td>agree</td>
<td>strongly agree</td>
</tr>
</tbody>
</table>

3b. For me, being able to sleep better is:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unimportant</td>
<td>Important</td>
<td>very important</td>
</tr>
</tbody>
</table>

4a. Participating in regular physical activity will help me have a more positive outlook

<table>
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<tr>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>strongly disagree</td>
<td>disagree</td>
<td>neither agree nor disagree</td>
<td>agree</td>
<td>strongly agree</td>
</tr>
</tbody>
</table>

4b. For me, having a more positive outlook is:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unimportant</td>
<td>Important</td>
<td>very important</td>
</tr>
</tbody>
</table>
Over the next four months:

<table>
<thead>
<tr>
<th>5a</th>
<th>Participating in regular physical activity will help me control my weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>strongly disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5b</th>
<th>For me, controlling my weight is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>unimportant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6a</th>
<th>Participating in regular physical activity will help me regain lost strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>strongly disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6b</th>
<th>For me, regaining lost strength is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>unimportant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7a</th>
<th>Participating in regular physical activity will help me prevent a cancer recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>strongly disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7b</th>
<th>For me, preventing a cancer recurrence is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>unimportant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8a</th>
<th>Participating in regular physical activity will be enjoyable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>strongly disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8b</th>
<th>For me, enjoying physical activity is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>unimportant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9a</th>
<th>Participating in regular physical activity will make me feel more fatigued</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Over the **next four months:**

<table>
<thead>
<tr>
<th>strongly disagree</th>
<th>disagree</th>
<th>neither agree nor disagree</th>
<th>agree</th>
<th>strongly agree</th>
</tr>
</thead>
</table>

9b  **For me, reducing fatigue is:**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>unimportant</td>
<td>Important</td>
<td>very important</td>
</tr>
</tbody>
</table>

10a  **Participating in regular physical activity will increase my joint pain**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>strongly disagree</td>
<td>disagree</td>
<td>neither agree nor disagree</td>
<td>agree</td>
<td>strongly agree</td>
</tr>
</tbody>
</table>

10b  **For me, reducing joint pain is:**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>unimportant</td>
<td>Important</td>
<td>very important</td>
</tr>
</tbody>
</table>

11a  **Participating in regular physical activity will result in lymphedema or lymphedema flare ups**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>strongly disagree</td>
<td>disagree</td>
<td>neither agree nor disagree</td>
<td>agree</td>
<td>strongly agree</td>
</tr>
</tbody>
</table>

11b  **For me, preventing lymphedema issues is:**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>unimportant</td>
<td>Important</td>
<td>very important</td>
</tr>
</tbody>
</table>

The following questions are about your preferences for engaging in physical activity. Please answer these questions in regards to the **next four months.** Please circle the number next to your preferred response.

12. **Who would you prefer to exercise with?** *(please circle a response)*

   1. I would prefer to exercise alone
   2. With other cancer survivors
   3. With friends
   4. With family
   5. My partner
   6. No preference

13. **Which of the following types of physical activity would you most like to do?** *(please circle all that apply)*

   1. Walking
   2. DIY activities such as yard work and maintenance
3  Cycling  
4  Gardening  
5  Dancing  
6  Swimming  
7  Weight training or other resistance-based exercises  
8  Individual sport (e.g. tennis) (*please specify*)  
9  Team sport (e.g. netball) (*please specify*)  
10  Yoga/Pilates  
11  Other (*please specify*)

14. What intensity would you prefer to exercise at? (*please circle a response*)

1  Light intensity (minimal effort, no perspiration)  
2  Moderate intensity (not exhausting, light perspiration)  
3  Vigorous intensity (heart beats rapidly, sweating)  
4  No preference

<table>
<thead>
<tr>
<th>Over the next 4 months:</th>
<th>Not at all confident</th>
<th>Slightly confident</th>
<th>Moderately confident</th>
<th>Very confident</th>
<th>Extremely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can walk for 20 minutes without stopping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can jog for 10 minutes without stopping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can climb 3 flights of stairs without stopping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can exercise for 20 minutes at a level hard enough to cause a large increase in heart rate and breathing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can do 6 wall push ups in a row</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can do one small session of resistance training, including 6 different exercises working different muscle groups.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can do yoga for 60 minutes</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

These next questions are about your confidence to engage in physical activity **over the next four months**

15. Please rate how confident you are that you could perform the following activities over the next 4 months (*Circle one number for each statement*).
These next questions are about how **confident** you are doing regular physical activity in different circumstances **over the next 4 months**.

16. Please rate how **confident** you are that you can engage in PA **over the next 4 months** when: *(Please circle one response for each question)*.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Not at all confident</th>
<th>Slightly confident</th>
<th>Moderately confident</th>
<th>Very confident</th>
<th>Extremely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>I lack the discipline to exercise</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Exercise is not a priority</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The weather is bad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am tired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I lack time</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I do not enjoy exercising</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I do not have someone to encourage me to exercise</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am in a bad mood or feeling depressed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have to do it by myself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can’t notice any improvements in my fitness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can’t notice any improvements in my body</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel a little stiff or sore</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel a little ill</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
17. Please rate how much you agree with the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know how to warm up and cool down before/after an exercise session</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have a good idea of how much physical activity I should do to gain health benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have a good idea of what type of physical activity I should do to gain health benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have a good idea of how hard I should engage in physical activity to gain health benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have the skills I need to engage in aerobic physical activities (e.g. walking, swimming, cycling)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have the skills I need to engage in resistance-based physical activities (e.g. machine weights, dumbbells, push ups, therabands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18. Since your diagnosis, has your doctor or another health professional provided you with any information about exercise?

1  No
2  Yes

19. Since your diagnosis, have you participated in any physical activity programs designed to help you increase your participation in physical activity?

1  No
2  Yes (please specify)
1. Please indicate which items you have in your home or yard *(Circle all that apply)*

1. Aerobic equipment (exercise bike, treadmill, elliptical etc)
2. Resistance training equipment (dumbbells, machine weights, therabands etc).
3. Sports equipment (football, tennis rackets, roller skates, etc)
4. Sports wear
5. Bicycle
6. Dog
7. Swimming pool
8. Exercise DVDs
9. Garden
10. Car/motorbike

2. Do you have a current membership at any fitness centre, gym or pool?

1. No
2. Yes

3. Do you know any breast cancer survivors who regularly engage in physical activity?

1. No
2. Yes

4. Have you heard or read many stories about breast cancer survivors engaging in physical activity?

1. No
2. Yes

5. Please rate how often you have observed people who are important to you being active over the last 4 months.

1. Never
2. Rarely
3. Sometimes
4. Often
5. Very often
These next questions are about your local environment. Think about the different facilities in and around your neighbourhood by this we mean the area ALL around your home that you could walk to in 10-15 minutes.

6. Please rate whether or not you agree or disagree with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most of the houses in my neighbourhood are detached houses (I.e they do not share a wall with other dwellings)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Many shops, stores, markets or other places to buy things I need are within easy walking distance of my home.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>My home is within a 10-15 minute walk to a bus or train station.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>There are footpaths on most of the streets in my neighbourhood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>There are facilities to bicycle in or near my neighbourhood, such as special lanes, separate paths or trails, shared use paths for cycles and pedestrians.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>My neighbourhood has several free or low cost recreation facilities, such as parks, walking trails, bike paths, recreation centres, playgrounds, public swimming pools, etc</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The crime rate in my neighbourhood makes it unsafe to go on walks at night.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Below is a list of things people might do or say to someone who is trying to exercise regularly. Under family, rate how often anyone living in your household has said or done what is described during the past 4 months. Under friends, rate how often your friends, acquaintances, or co-workers have said or done what is described during the past 4 months.

7. **During the past 4 months, my family (or members of my household) or friends:**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Family</th>
<th>Not at all</th>
<th>Rarely</th>
<th>A few times</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercised with me.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gave me encouragement to stick with my exercise program.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Changed their schedule so we could exercise together.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Offered to exercise with me.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gave me helpful reminders to exercise (&quot;Are you going to exercise tonight?&quot;)</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Planned for exercise on recreational outings.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Discussed exercise with me</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Talked about how much they like to exercise.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Helped plan activities around my exercise.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Asked me for ideas on how they can get more exercise.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Took over chores so I had more time to exercise.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Made positive comments about my physical appearance.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Got angry at me for exercising</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Criticised or made fun of me for exercising</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
7. **During the past 4 months**, my family (or members of my household) or friends:

<table>
<thead>
<tr>
<th>Gave me rewards for exercising</th>
<th>Family</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Friends</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

### Section F

These questions are about ways of managing your physical activity

1. **Over the past 4 months**, how often did you do each of the following on average, over a typical week?

<table>
<thead>
<tr>
<th>I mentally kept track of my physical activity</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>I mentally noted specific things that helped me be active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I set short term goals for how often I am active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I set physical activity goals that focused on my health</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I asked someone for physical activity advice or a demonstration</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I asked a physical activity expert or health professional for physical activity advice or a demonstration</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>After physical activity I focused on how good it felt</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I reminded myself of physical activity health benefits</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I mentally scheduled specific times for physical activity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I rearranged my schedule to ensure I had time for physical activity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I purposefully planned ways to do physical activity when on trips away from home</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I purposely planned ways to do physical activity in bad weather</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
I set small challenges for myself while I was engaging in physical activity

2. The following statements are about your physical activity plans over the next two weeks. Please read each statement and select the response that matches your plans best.

<table>
<thead>
<tr>
<th>I have made plans concerning ‘when’ I am going to engage in regular physical activity over the next 2 weeks</th>
<th>No plans</th>
<th>Some plans</th>
<th>Detailed plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have made plans concerning ‘where’ I am going to engage in regular physical activity over the next 2 weeks</th>
<th>No plans</th>
<th>Some plans</th>
<th>Detailed plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have made plans concerning ‘what’ kind of regular physical activities I am going to engage in over the next 2 weeks</th>
<th>No plans</th>
<th>Some plans</th>
<th>Detailed plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have made plans concerning ‘how’ I am going to get to a place to engage in regular physical activity over the next 2 weeks</th>
<th>No plans</th>
<th>Some plans</th>
<th>Detailed plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Section G
Please answer the following questions relating to your health and quality of life.

1. In general, would you say your health is: (please circle one response)

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Very good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

2. Please rate how much your physical health limits your ability to engage in regular physical activity

1. Not at all limited
2. A little limited
3. Somewhat limited
4. Mostly limited
5. Completely limited
3. **How much do you weigh in kilograms?** __________ Kg (skip if you would prefer not to answer)

4. **How tall are you in inches or centimetres?** __________ Inches or _______ cm

5. **Please select the response that best matches how you feel. I consider myself to be:**
   1. Underweight
   2. Healthily weight
   3. Over weight
   4. Obese
   5. Prefer not to answer

6. **Have you been through menopause?**
   1. No
   2. Yes
   3. Prefer not to answer

7. **Has a doctor ever told you that you have any of the following health conditions? (please circle a response for each item)**

<table>
<thead>
<tr>
<th>Condition</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis (rheumatoid and osteoarthritis)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Asthma</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease (COPD), acquired respiratory distress syndrome (ARDS), or emphysema</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Angina</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Congestive heart failure (or heart disease)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Heart attack (myocardial infarct)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Neurological disease (such as multiple sclerosis or Parkinson's)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Stroke or TIA</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes types I or II</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Upper gastrointestinal disease (ulcer, hernia, reflux)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Depression</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
7. **Has a doctor ever told you that you have any of the following health conditions?** (please circle a response for each item)

<table>
<thead>
<tr>
<th>Condition</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety or panic disorders</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Visual impairment (such as cataracts, glaucoma, macular degeneration)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Hearing impairment (very hard of hearing, even with hearing aids)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Degenerative disc disease (back disease, spinal stenosis, or severe chronic back pain)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Obesity</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Lymphedema</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other? Please describe</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

8. **Over the past 7 days:**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Some what</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have a lack of energy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have nausea</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Because of my physical condition, I have trouble meeting the needs of my family</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have pain</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am bothered by side effects of treatment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel ill</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am forced to spend time in bed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel close to my friends</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I get emotional support from my family</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Below is a list of statements that other breast cancer survivors have said are important. Some of these questions may not seem relevant to you personally. Please try and answer every question. Please circle one number per line to indicate your response as it applies to the **past 7 days**.
<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Some what</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I get support from my friends</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>My family has accepted my illness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am satisfied with my family communication about my illness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel close to my partner (or the person who is my main support)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Regardless of your current sexual activity, please answer the next question. If you would prefer not to answer it, please mark this box and go to the next question.

<table>
<thead>
<tr>
<th>Question</th>
<th>1 2 3 4 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am satisfied with my sex life</td>
<td></td>
</tr>
<tr>
<td>I feel sad</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am satisfied with how I am coping with my illness</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am losing hope in the fight against my illness</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I feel nervous</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I worry about dying</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I worry that my condition will get worse</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am able to work</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>My work (include work at home) is fulfilling</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am able to enjoy life</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I have accepted my illness</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am sleeping well</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am enjoying the things I usually do for fun</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am content with the quality of my life right now</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I have been short of breath</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
8. **Over the past 7 days:**

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little bit</th>
<th>Some what</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am self-conscious about the way I dress</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>One or both of my arms are swollen or tender</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel sexually attractive</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am bothered by hair loss</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I worry that other members of my family might someday get the same illness I have</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I worry about the effect of stress on my illness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am bothered by changes in weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am able to feel like a women</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have certain parts of my body where I experience pain</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

These questions are about your experience with fatigue. Please circle one number per line to indicate your response as it applies to the past 7 days.

9. **Over the past 7 days:**

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little bit</th>
<th>Some what</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel fatigued</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel weak all over</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel listless (“washed out”)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel tired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have trouble starting things because I am tired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have trouble finishing things because I am tired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
MOVE MORE FOR LIFE STUDY

Section H
Please answer the following questions about your prior participation in research studies

1. Have you previously participated in a research study that you think may have had an impact on your participation in physical activity or how you feel and think about physical activity?

   1. No
   2. Yes (please provide details of the research study here).

2. Are you currently involved in any other research studies?

   1. No
   2. Yes (please provide details of the research study/studies here)
Move More for Life Pedometer instructions

While wearing the pedometer you should do your normal daily activities, not particularly more or less than usual. You will need to put the pedometer on first thing in the morning and take it off just before you go to bed at night, each day for seven days.

On the first morning, press the reset button on your pedometer to ensure that the counter is set to zero (i.e. “00000 step”).

Please do not reset the pedometer again, let the steps accumulate through the week and record your accumulated total. If this happens by accident, please record the time, and the steps showing before the reset (if you happen to have noted it).

- **In the morning**
  Attach the pedometer to your waistband or belt on either side in line with your foot.
  Go about your normal daily activities.
  You cannot get the pedometer wet so please remove it for showers, swimming and also for contact sports (eg. football)

- **In the evening**
  Remove the step counter from your clothing.
  Record the Date, Time Commenced, Time Finished, and the number of steps (top row on the counter) on the back of this sheet. Record also if you have been doing activities the counter doesn’t register (eg cycling or lifting weights) or activities when you removed the pedometer (eg. swimming, water aerobics). If you forget to wear the pedometer on any one day or for a part of a day, simply note this on the sheet in the ‘comments’ column. Store the pedometer somewhere you will notice it in the morning (eg next to your watch or on your bedside table).
- At end of day 7
  Record the use of the pedometer as you normally do.
  **Place the pedometer, this sheet and your completed MM4L Questionnaire in the Reply Paid Envelope provided.**
  Please Do NOT change any of the settings on the pedometer.

---

**Move More for Life Pedometer Diary**

Wear the step counter from when you get up in the morning until when you get undressed in the evening. At the end of each day, write the number on the counter in the column below. Do not reset the counter to zero. Please do not get the pedometer wet.

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Time Commenced</th>
<th>Time Finished</th>
<th>Number on counter</th>
<th>Comments</th>
<th>Other Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Swimming, cycling, weights, yoga, pilates</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Place the pedometer, this sheet and your completed MM4L Questionnaire in the Reply Paid Envelope provided.*

---

If you have any questions about the study, or completing this sheet please telephone Camille Short (Project Co-ordinator) on (02) 4042 0647 or email Cherp –movemoreforlife@newcastle.edu.au
Appendix 5.7 Process evaluation questions included in 4 month follow-up survey
<table>
<thead>
<tr>
<th>1. In the last 4 months, did you receive any printed health information (not including surveys) in the mail from the Move More for Life project?</th>
<th>2. How many times did you receive printed health information (not including surveys) in the mail from the Move More for Life Project?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No (please skip this section)</td>
<td>1. Once</td>
</tr>
<tr>
<td>2. Yes</td>
<td>2. Twice</td>
</tr>
<tr>
<td></td>
<td>3. Three time</td>
</tr>
<tr>
<td></td>
<td>4. Four times</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Did the materials catch your attention?</th>
<th>4. How interesting was the health information you received?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Not at all</td>
<td>1. Not at all interesting</td>
</tr>
<tr>
<td>2. A little</td>
<td>2. A little interesting</td>
</tr>
<tr>
<td>4. Quite a bit</td>
<td>4. Quite interesting</td>
</tr>
<tr>
<td>5. Very much</td>
<td>5. Very interesting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. How much, if any, of the information did you read?</th>
<th>6. How informative did you find the health information you received?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. None of it</td>
<td>1. Not at all</td>
</tr>
<tr>
<td>2. Some of it</td>
<td>2. A little</td>
</tr>
<tr>
<td>3. Most of it</td>
<td>3. Somewhat</td>
</tr>
<tr>
<td>4. All of it</td>
<td>4. Quite</td>
</tr>
<tr>
<td></td>
<td>5. Very</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. How difficult or easy was it to understand the information?</th>
<th>8. In your opinion, how trustworthy was the information?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Very difficult</td>
<td>1. Not at all trustworthy</td>
</tr>
<tr>
<td>2. Difficult</td>
<td>2. A little trustworthy</td>
</tr>
<tr>
<td>3. Neither difficult nor easy</td>
<td>3. Somewhat trustworthy</td>
</tr>
<tr>
<td>4. Easy</td>
<td>4. Quite trustworthy</td>
</tr>
<tr>
<td>5. Very easy</td>
<td>5. Very trustworthy</td>
</tr>
<tr>
<td>Question</td>
<td>Options</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9. How much did you like the materials you read?</td>
<td>1  Not at all</td>
</tr>
<tr>
<td></td>
<td>2  A little</td>
</tr>
<tr>
<td></td>
<td>3  Somewhat</td>
</tr>
<tr>
<td></td>
<td>4  Quite a bit</td>
</tr>
<tr>
<td></td>
<td>5  Very much</td>
</tr>
<tr>
<td>10. Do you still have the information you received?</td>
<td>1  No</td>
</tr>
<tr>
<td></td>
<td>2  Yes</td>
</tr>
<tr>
<td>11. How personally relevant was the health information you received?</td>
<td>1  Not at all relevant</td>
</tr>
<tr>
<td></td>
<td>2  A little relevant</td>
</tr>
<tr>
<td></td>
<td>3  Somewhat relevant</td>
</tr>
<tr>
<td></td>
<td>4  Quite a bit relevant</td>
</tr>
<tr>
<td></td>
<td>5  Very relevant</td>
</tr>
<tr>
<td>12. How encouraging were the health information materials?</td>
<td>1  Not at all encouraging</td>
</tr>
<tr>
<td></td>
<td>2  A little encouraging</td>
</tr>
<tr>
<td></td>
<td>3  Somewhat encouraging</td>
</tr>
<tr>
<td></td>
<td>4  Quite a bit encouraging</td>
</tr>
<tr>
<td></td>
<td>5  Very encouraging</td>
</tr>
<tr>
<td>13. As a result of the health information, have you changed your physical activity behaviour?</td>
<td>1  No</td>
</tr>
<tr>
<td></td>
<td>2  Yes</td>
</tr>
<tr>
<td>14. How useful were the materials in helping you change your physical activity behaviour?</td>
<td>1  Not at all useful</td>
</tr>
<tr>
<td></td>
<td>2  A little useful</td>
</tr>
<tr>
<td></td>
<td>3  Somewhat useful</td>
</tr>
<tr>
<td></td>
<td>4  Quite a bit useful</td>
</tr>
<tr>
<td></td>
<td>5  Very useful</td>
</tr>
<tr>
<td>15. Did you discuss the information with anyone?</td>
<td>1  No</td>
</tr>
<tr>
<td></td>
<td>2  Yes (Please specify)</td>
</tr>
<tr>
<td></td>
<td>___________________</td>
</tr>
<tr>
<td>16. Do you have any comments that you would like to make about the materials you received?</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 5.8 Process evaluation questions included in 10 month follow-up survey
1. **Do you still have the printed health information you received in the mail from the Move More for Life Project (not including surveys)?**
   - 1. No
   - 2. Yes

2. **How useful were the materials in helping you improve your aerobic physical activity (e.g. walking, swimming) participation over the past 10 months?**
   - 1. Not at all useful
   - 2. A little useful
   - 3. Somewhat useful
   - 4. Quite a bit useful
   - 5. Very useful

3. **How useful were the materials in helping you improve your resistance-based physical activity (e.g. weight lifting, sit ups) participation over the past 10 months?**
   - 1. Not at all useful
   - 2. A little useful
   - 3. Somewhat useful
   - 4. Quite a bit useful
   - 5. Very useful

4. **How useful were the materials in helping you to reduce the amount of time you spend in prolonged sedentary behaviour? (i.e., sitting for prolonged periods without a break)**
   - 1. Not at all
   - 2. A little bit
   - 3. Somewhat
   - 4. Quite a bit
   - 5. Very much

5. **How useful were the materials in helping you maintain regular physical activity over the past 10 months?**
   - 1. Not at all useful
   - 2. A little useful
   - 3. Somewhat useful
   - 4. Quite a bit useful
   - 5. Very useful

6. **How useful were the materials in helping you increase your confidence for engaging in regular physical activity over the past 10 months?**
   - 1. Not at all useful
   - 2. A little useful
   - 3. Somewhat useful
   - 4. Quite a bit useful
   - 5. Very useful
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
</table>
| **7. How useful were the materials in helping you overcome barriers to participating in physical activity over the past 10 months?** | 1 Not at all useful  
2 A little useful  
3 Somewhat useful  
4 Quite a bit useful  
5 Very useful |
| **8. Did the materials help you to increase the support you receive for participating in physical activity?** | 1 Not at all  
2 A little bit  
3 Somewhat  
4 Quite a bit  
5 Very much |
| **9. Did the materials help you to come up with a physical activity plan?** | 1 Not at all  
2 A little bit  
3 Somewhat  
4 Quite a bit  
5 Very much |
| **10. Would you have liked to receive more information about physical activity from the Move More for Life team over the past 10 months?** | 1 Not at all  
2 A little bit  
3 Somewhat  
4 Quite a bit  
5 Very much |
| **11. Was completing the forms sent to you a burden?** | 1 Not at all  
2 A little bit  
3 Somewhat  
4 Quite a bit  
5 Very much |
| **12. Would you recommend the physical activity materials you received to other cancer survivors?** | 1 Not at all  
2 A little bit  
3 Somewhat  
4 Quite a bit  
5 Very much |
| **13. Do you have any comments that you would like to make about the materials you received?** | |

**Note:** The responses are rated on a scale from 1 (not at all) to 5 (very much).
<table>
<thead>
<tr>
<th>1. Would you have liked to receive information about healthy eating as well as physical activity from the Move More for Life Team?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Not at all</td>
</tr>
<tr>
<td>2. A little bit</td>
</tr>
<tr>
<td>3. Somewhat</td>
</tr>
<tr>
<td>4. Quite a bit</td>
</tr>
<tr>
<td>5. Very much</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Do you think it would be better to receive information about healthy eating and physical activity at the same time or separately over time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I would prefer to focus on improving nutrition and physical activity at the same time</td>
</tr>
<tr>
<td>2. I would prefer to focus on physical activity first</td>
</tr>
<tr>
<td>3. I would prefer to focus on nutrition first</td>
</tr>
<tr>
<td>4. I don’t think it would make a difference</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Would you have liked to receive information about maintaining a healthy weight from the Move More for Life team?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Not at all</td>
</tr>
<tr>
<td>2. A little bit</td>
</tr>
<tr>
<td>3. Somewhat</td>
</tr>
<tr>
<td>4. Quite a bit</td>
</tr>
<tr>
<td>5. Very much</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. If you had a choice, would you prefer to receive health promotion materials via:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mail</td>
</tr>
<tr>
<td>2. Email</td>
</tr>
<tr>
<td>3. Websites</td>
</tr>
<tr>
<td>4. Face-to-face (one-on-one)</td>
</tr>
<tr>
<td>5. Face-to-face (group setting)</td>
</tr>
<tr>
<td>6. DVD</td>
</tr>
<tr>
<td>7. Telephone</td>
</tr>
<tr>
<td>8. SMS Text messages</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. If you had a choice, would you prefer to receive support for changing or maintaining health behaviours:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Weekly</td>
</tr>
<tr>
<td>2. Fortnightly</td>
</tr>
<tr>
<td>3. Monthly</td>
</tr>
<tr>
<td>4. Other (please specify)</td>
</tr>
</tbody>
</table>

| 6. If you had a choice, how long would you like to receive support for changing or maintaining health behaviours (please specify in either weeks/months/years): |
Appendix 5.9 Statements of contribution from co-authors
Statement of contribution

I, Erica L James, attest that Research Higher Degree candidate Camille E Short contributed substantially— in terms of study concept and design, and preparation of the manuscript—to the publication:


16 April 2013

A/Prof. Erica L James (Co-author)  

Camille E Short (Candidate)  

(Assistant Dean Research Training)  

Date  

Date  

Date
Statement of contribution

I, Araf Girgis, attest that Research Higher Degree candidate Camille E Short contributed substantially— in terms of study concept and design, literature searching and analysis, and preparation of the manuscript—to the publication:


Prof Araf Girgis (Co-author)  
Date: 28/2/13

Camille E Short (Candidate)  
Date: 24/4/13

(Assistant Dean Research Training)  
Date: 3/6/13
Statement of contribution

I, Patrick Mcelduff, attest that Research Higher Degree candidate Camille E Short contributed substantially - in terms of study concept and design, literature searching and analysis, and preparation of the manuscript - to the publication:


A/prof. Patrick Mcelduff (Co-author)  
Date: 25/2/2013

Camille E Short (Candidate)  
Date: 24/4/13

(Assistant Dean Research Training)  
Date: 3/5/13
Statement of contribution

I, Ronald C Plotnikoff, attest that Research Higher Degree candidate Camille E Short contributed substantially— in terms of study concept and design, literature searching and analysis, and preparation of the manuscript— to the publication:


Prof Ronald C Plotnikoff (Co-author)  
Date  21/02/12

Camille E Short (Candidate)  
Date  29/04/13

(Assistant Dean Research Training)  
Date  5/6/13
Appendix 6

All documents in this Appendix relate to the manuscript presented in chapter 7 of volume 1:

‘Main outcomes of the *Move More for Life* Trial. A randomised trial of the effects of tailored and targeted-print materials on physical activity, sitting – time and quality of life among post-treatment breast cancer survivors’
Appendix 6.1 Statements of contribution from co-authors
Statement of contribution

I, Erica L James, attest that Research Higher Degree candidate Camille E Short contributed substantially-in terms of study concept and design, and preparation of the manuscript-to the publication:


16 April 2013

A/Prof. Erica L James (Co-author)  Date

Camille E Short (Candidate)  Date

[Assistant Dean Research Training]  Date
Statement of contribution

I, Afaf Girgis, attest that Research Higher Degree candidate Camille E Short contributed substantially—in terms of study concept and design, literature searching and analysis, and preparation of the manuscript—to the publication:


29/2/13

Prof Afaf Girgis (Co-author)

29/2/13

Camille E Short (Candidate)

3/5/13

(Assistant Dean Research Training)
Statement of contribution

I, Mario D’Souza, attest that Research Higher Degree candidate Camille E Short contributed substantially— in terms of study concept and design, literature searching and analysis, and preparation of the manuscript—to the publication:


21 Feb 2013

Dr Mario D’Souza (Co-author)  Date

24/4/13

Camille E Short (Candidate)  Date

3/6/13

Assistant Dean Research Training)  Date
Statement of contribution

I, Ronald C Plotnikoff, attest that Research Higher Degree candidate Camille E Short contributed substantially in terms of study concept and design, literature searching and analysis, and preparation of the manuscript to the publication:


Prof Ronald C Plotnikoff (Co-author)  21/1/2012

Camille E Short (Candidate)  24/4/2013

(Assistant Dean Research Training)  25/1/2013