University of Alberta

Young Adult Cancer Survivors, Physical Activity and Health

by

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This dissertation is dedicated to all the research participants I worked with. They continue to inspire me daily.

Abstract

The purpose of this dissertation was to identify the key preferences, determinants of physical activity (PA), and sports participation in young adult cancer survivors (YACS) and then use this information to develop a theory-based, PA behavior change intervention. To achieve this aim, my dissertation comprises of three studies. A cross-sectional survey designed to identify the preferences, determinants and sports association to PA in a population-based sample of 588 young adult cancer survivors. The majority of YACS indicated they were able and willing to participate in a program to increase PA, preferred to do PA with others, in their communities and receive information about PA 3-6 months post diagnosis by brochure/print material. The theory of planned behavior (TPB) explained 38% of variance with intention being the strongest independent correlate to PA. Planning, affective attitude, general health, education also had independent contributions. Perceived behavioral control (PBC) was the strongest predictor of intention. Approximately one third (32.5%) of YACS participated in sport in the last month with the most common reported sports: golf, hockey and tennis. Sport participation had a positive correlation to psychosocial variables and quality of life (QoL) scores. Based on these results and directed by the TPB a PA guidebook for YACS was developed and evaluated by experts in TPB, exercise oncology, health informatics, oncology, and YACS. These evaluations directed further changes to the guidebook. This guidebook (TPAG) was compared to the Canadian Physical Activity Guidelines (CPAG) in a randomized control trial of 212 YACS. The TPAG did not increase PA minutes in the overall sample of YACS. Due to

the very active sample, a separate analysis was conducted for YACS reporting less than 300 minutes of PA/week. At three months, the TPAG group reported a significant 90 minutes of PA/week more than the CPAG group. As predicted, the TPAG did not affect the TPB variables of the overall sample. The TPAG did however affect affective attitude, PBC and descriptive norms at three month follow up of YACS reporting less than 300 minutes of PA/week. Overall, the results suggest that the TPAG is superior to a generic PA recommendation to the less active YACS.

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Chapter 1

Introduction

Cancer in Young Adults

Young adult cancer survivors (YACS) represent 10% of the total amount of cancer diagnosis in Canada[1] and the United States[2]. YACS are individuals diagnosed with cancer between the ages of 18 and 39. As there is no consistent definition of 'young adult' we chose the lower age limit as the age which adulthood is initiated from a legal standpoint for voting, signing contracts, and so forth (ie 18). This age range is also when individuals graduate from high school, a known decline in physical activity (PA) and engaging in more decision making for health behaviors. The upper limit (ie. 39) is consistent with the Adolescent and Young Adult Progress Review [2] assembled by the National Cancer Institute, Lance Armstrong Foundation and Young Adult Cancer Canada (among many other support groups/organizations). This age range of 18-39 is predominate age range in literature about YACS[3-12].

Young adults are a unique population, possessing many distinctive physiological and psychosocial characteristics. Even so, medicine has traditionally been divided into pediatric and internal medicine departments, resulting in young adults falling between the gaps of these two disciplines[10]. Cancer is the leading cause of non-accidental death among young adults. Eight times as many young adults are diagnosed with cancer than children less than 15 years of age[1]. Cancer patterns in adolescents and young adults differ from those of children and older adults for numerous reasons. Twenty years ago, YACS had a

higher survival rate than pediatric and older adult cancer survivors[2]. Since then, a tremendous amount of research, advances in treatment, surgical procedures and care have increased the survival rates of pediatric and older adult cancer survivors but a similar improvement in survival rates has not been observed for the young adult cancer population[2]. The lack of progress in YACS could be attributed to the current lack of knowledge about this particular cohort, lack of participation and availability of clinical trials, lack of follow-up treatment, as well as lagging health professional education geared towards the specific needs of this population[1, 2, 10].

Side Effects and Long Term Complications of Cancer and Cancer Related Treatment

The current five-year survival rate of YACS is approximately 85%, the majority of YACS will live for decades longer[1], however, they face many challenges following potential curative or remission therapy, affecting their health, personality, emotions, and social relations[6, 10]. YACS may have physical changes due to surgery, radiation therapy, chemotherapy and immunotherapy causing physical limitations and challenges to QoL [10]. YACS who have had amputations, disfiguring surgery, or colostomies, may have limitations on physical functioning, self-esteem, and coping. Surgery, radiation therapy, or chemotherapy can cause damage to vital organs, such as heart, lungs, kidneys, peripheral nerves and the gastrointestinal tract. YACS are also at an increased risk of cardiovascular disease, a second malignancy and possibly other

health concerns such as obesity and chronic fatigue. These health risks make it important for YACS to address the modifiable risk factors[6, 8, 13].

There may an indirect increased risk of cardiovascular disease for YACS because of weight gain or induced menopause from treatment in YACS [14]. Given that YACS are at increased risk of cardiovascular disease it is important that modifiable risk factors such as sedentary lifestyle are addressed[4, 6]. YACS may also have an increased risk of cardiovascular disease due to treatment received. Chemotherapy and radiation therapy has been show to increase cardiovascular disease in both Hodgkin's lymphoma and testicular cancer, both cancers that occur during the young adult years [14-16].

In addition to cardiovascular health implications YACS may also be at risk for other medical conditions, such as secondary malignancies [20-21], weight gain [18, 22]. In addition, cancer survivors of many kinds of cancer report chronic fatigue after their treatments[23, 24]. PA has been found to have a positive effect on body composition [23] and fatigue in cancer survivors [26, 27] and prospective studies have demonstrated an increase disease specific and all cause mortality [28].

Cancer survivors often have anxiety, depression, psychological distress, loss of control, and fear. The stress of coping with a cancer diagnosis ranges from mild to severe, often depending on the severity of the diagnosis and treatment and the prior mood of survivors[11]. Mood usually improves over time for many survivors.

Physical Activity Defined

PA is defined by the Canadian Society for Exercise Physiology (CSEP) as 'movement that increases heart rate a breathing' and 'any bodily movement produced by skeletal muscles that requires energy expenditure.' Moderate intensity PA is defined by CSEP as 'PA that is performed at 3.0–5.9 times the intensity of rest for adults, On a scale relative to an individual's personal capacity, moderate-intensity PA is usually a 5 or 6 on a scale of 0–10. If you're doing moderate-intensity activity you can talk, but not sing, during the activity. You're working hard enough to raise your heart rate and start perspiring.' Vigorous intensity PA is defined by CSEP as 'PA that is performed at 6.0 or more times the intensity of rest for adults, On a scale relative to an individual's personal capacity, vigorous-intensity PA is usually a 7 or 8 on a scale of 0–10. If you're doing vigorous-intensity activity, you will not be able to say more than a few words without pausing for a breath. Your heart rate has gone up quite a bit, you will be perspiring[28].

Benefits of Physical Activity in Cancer Survivors

PA can positively affect the side effects from cancer and its treatment and therefore improve psychosocial variable, physical fitness and QoL of cancer survivors before and after treatment (Appendix A and B). A recent meta-analysis [30] evaluating 66 studies showed many health benefits to PA both during and after cancer treatments. Results indicated a large effect of PA post treatment on strength. Positive effects were also found for PA during treatment on PA level,

aerobic fitness, muscular strength, functional quality of life, anxiety and self-esteem. Among studies reviewed, most studies demonstrated that exercise was well tolerated by survivors on and off treatment. In another systematic review examining ten prospective cohort studies, a trend towards increased survival with greater levels of PA was demonstrated. Although exercise has numerous benefits for many cancer survivor groups, there is limited research on YACS.

In a survey of 588 YACS, an analysis of covariance adjusted for important medical and demographic covariates showed a statistically significant and clinically meaningful dose-response association between PA and the physical component summary from completely sedentary to within PA guidelines. Similar associations were found for the mental component summary scale, depression, stress and self-esteem. Associations between PA and QoL were stronger for YACS that had previously received chemotherapy[11].

Prevalence of Physical Activity in Cancer Survivors

The U.S. Federal Government guidelines recommend at least 75 minutes of vigorous PA/week or 150 minutes of moderate PA/week—or an equivalent combination of the two intensities–to attain health benefits. These PA guidelines have been endorsed by the American College of Sports Medicine [33] and the American Cancer Society [29].

Cancer survivors have an increased risk of becoming sedentary for numerous reasons. Cancer survivors tend to reduce the amount of PA they do when they are diagnosed, and tend to steadily decline their activity level as they progress through treatment and rarely return to their prediagnosis activity level.

Survivors may decrease the amount of activity they do due to adverse side effects of cancer or cancer treatment.

According to a large Canadian based survey, only 22% of cancer survivors were physically active[33]. The prevalence of PA in cancer survivors in Canada was slightly lower to rates found in a survey in the United States, 24% by Coups and Ostroff [34] and 30% by Bellizzi et al. [35] although the cut points for PA varied. Coups and Ostroff [34] reported no difference in PA prevalence in survivors 18-39 years old and their noncancer controls.

In a survey of YACS in Alberta, only approximately half of the YACS reported meeting PA public health guidelines. Participants averaged 86 minutes of moderate PA and 72 minutes of vigorous PA per week. In terms of public health guidelines, 24% were completely sedentary, 25% were insufficiently active, 22% were active within guidelines, and 29% were active above guidelines. For the other PA grouping variables, 33.3% reported meeting vigorous PA guidelines, 42.2% reported meeting resistance PA guidelines, and 32.5% reported sport participation. Given these findings, there is a need to develop and evaluate of communication and PA promotion in YACS[13].

Purpose of the Dissertation

The purpose of my dissertation was to identify the key preferences, determinants of PA, and sports association to PA in YACS and then use this information to develop a theory-based, PA behavior change intervention. To achieve this aim, my dissertation is comprised of three studies. Study 1 was a cross-sectional survey designed to identify the preferences, determinants and

sports association to PA in a population-based sample of 588 young adult cancer survivors. Paper 1 from Study 1 reported the key PA preferences in YACS and has been accepted for publication in *Cancer Nursing* (Chapter 2). Paper 2 from Study 1 (Chapter 3) reported the key medical, demographic, and social cognitive determinants of PA in YACS using the theory of planned behavior and has been accepted for publication in the *American Journal of Health Behavior*. Paper 3 from study 1 (Chapter 4) reported sport prevalence, correlates, and psychosocial outcomes of sports participation in YACS and has been accepted for publication in the *Psychology of Sport & Exercise*. For Study 2, I developed and evaluated a theory based PA guidebook 'Stride to Survive' based on the results from Study 1 (Chapter 5). For Study 3 of my dissertation, I tested the effectiveness of this guidebook in promoting PA in YACS using a randomized controlled trial (Chapter 6) and evaluating the determinants of PA behavior change (Chapter 7).

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Chapter 2

A Survey of physical activity programming and counseling preferences in young adult cancer survivors

A version of this chapter has been accepted for publication. Belanger LJ, Plotnikoff RC, Clark A, Courneya KS. A survey of physical activity programming and counseling preferences in young adult cancer survivors. Cancer Nursing. 2012; 35(1):48-54.

Approximately 10 000 young adults between the ages of 20 and 44 years are diagnosed with cancer each year in Canada, and more than 100 000 are diagnosed in the United States.[2] Although somewhat arbitrary, this age range encompasses the shift from adolescence, generally defined as 15 to 19 years of age, and the average age at onset for menopause- associated hormonal changes in women, which directly affects their cancer profile.[1] Another common definition of young- adult cancer survivor includes the ages of 20 to 39 years.[3] The most common types of cancers in young adults are breast for females and testicular for males.[4]

Being diagnosed with cancer as a young adult is particularly devastating because of the potential to spend decades living with the psychological, physical, reproductive, social, and spiritual effects of the disease and its treatments. Given the greater number of potential years of survivorship for young-adult cancer survivors, it is important to promote physical activity because of its strong link to health-related fitness, quality of life, and possibly even disease and survival outcomes.[5Y7] Few research studies, however, have focused on physical activity in young-adult cancer

survivors.

We recently completed a population-based survey of young- adult cancer survivors in Alberta, Canada,[8] and found that only half were meeting physical activity guidelines based on public health recommendations from the US Department of Health and Human Services.[9] These guidelines suggest that individuals should obtain either 75 minutes of vigorous activity per week, 150 minutes of moderate activity per week, or an equivalent combination and have also been endorsed for cancer survivors by the American Cancer Society[10] and the American College of Sports Medicine.[11] Moreover, we found a strong positive association between achieving the physical activity guidelines and improved health-related quality of life in this population.[8] In the present study, we report the physical activity preferences of young-adult cancer survivors from the survey.

Physical activity preferences may be important because of their potential to influence physical activity participation and adherence. Most social cognitive models of human behavior suggest that allowing individuals to choose their behavior based on preferences is likely to optimize motivation and even psychological outcomes. For example, the theory of planned behavior[12] proposes that people will likely choose a behavior they believe will be most beneficial to them, highly enjoyable, and supported by others and that they have confidence in performing. Previous

research on physical activity preferences in cancer survivors has focused on disease-specific cancer survivor groups[13,17] rather than age groups. It is possible that young- adult cancer survivors may have different preferences for physical activity than their middle-aged and older counterparts. Yet, few of the preference studies have included young-adult cancer survivors, let alone reported the preferences separately for young adults. The objectives of the present study were to ascertain the interest and preferences of young-adult cancer survivors regarding participating in physical activity and to determine if any of these preferences varied by important demographic and medical variables.

Methods

Participants and Procedures

Details of the study procedures have been reported elsewhere.[8] Briefly, the Alberta Cancer Board and the University of Alberta granted ethical approval to conduct a postal survey of 2000 young-adult cancer survivors identified through the Alberta Cancer Registry. Eligibility for the study included: (a) diagnosed with invasive cancer in Alberta between the ages of 20 and 44 years and (b) still currently between the ages of 20 and 44 years and (c) living in Alberta. The survey (Appendix C) was conducted by the Alberta Cancer Registry on behalf of the investigators and followed the Total Design Method.[18] In the initial mailed materials, prospective

participants received (a) a letter of invitation from the registry explaining the general purpose of the registry and its role in this particular study, (b) a letter from the investigators explaining the study, and (c) a copy of the survey. A postcard reminder was mailed 3 to 4 weeks later, and a second survey was mailed 3 to 4 weeks after that to nonresponders.

Preference Measures

Physical activity preferences were assessed using 9 closed-item questions and 4 open-ended questions taken from previous surveys in cancer survivors.[5Y9] The specific questions and response options are provided in Table 1. Briefly, 2 of the 9 closed-item questions allowed participants to choose more than 1 answer (ie, where they would prefer to do a physical activity program and how they would like to receive physical activity information). The remaining 7 closed-item questions asked participants to select only 1 response. Two open-ended questions each were asked about favorite summer and winter activities. For each open-ended question, participants were able to list up to 3 top preferences. Three other questions asked participants about home exercise equipment, membership at a fitness center, and access to the Internet.

Proposed Moderators

To test for the moderating effects of demographic and medical

variables, all physical activity preferences and medical/demographic variables were either dichotomized or trichotomized (Table 1 and Table 2). Specifically, the moderators examined were current physical activity (meeting public health guidelines vs not meeting public health guidelines), age (20-29 vs 30-39 vs 40-44 years), sex, marital status (married vs unmarried), education (college degree vs less than college degree), body mass index (normal vs overweight vs obese), months since diagnosis (<60 months vs >60 months), surgery (yes vs no), radiation (yes vs no), chemotherapy (yes vs no), current cancer status (disease-free vs existing disease), current treatment status (on treatment vs off treatment), household annual income (<$100 000 vs >$100 000), employment (full time vs other), and type of cancer (breast vs thyroid vs other). For the preferences, we combined ''yes'' and ''maybe'' responses when the options were yes, no, and maybe. For ''when to start physical activity,'' we combined ''before and during treatment'' versus the ''posttreatment'' options. For modality of counseling and location of physical activity, the responses were analyzed as selecting versus not selecting that option.

Statistical Analysis

SPSS 17.0 (SPSS Inc, Chicago, Illinois) was used for all analyses. Frequencies and percentages of each response for physical activity preference items were calculated using descriptive statistics. A X^2 analysis

was used to examine each moderator (eg, age) by each preference (eg, when to start a physical activity program).

Results

Participant flow through the study has been reported elsewhere.[8] Briefly, of the 2000 mailed surveys, 588 surveys were returned completed, and 460 were returned because of a wrong address, resulting in a 29% completion rate (588/2000) and a 38% response rate (588/1540), excluding the wrong addresses. summer (40%) and winter (51%), followed by biking (33%) in the summer and skiing (33%) in the winter. Finally, 31% of young-adult cancer survivors held a current membership to a fitness center, and 63% reported exercise equipment at home. The vast majority had access to the Internet (96%).

Moderators of Physical Activity Preferences

There were many statistically significant moderators of physical activity preferences, and these are summarized in Tables 3 (demographic) and 4 (medical). The most consistent moderators of physical activity preferences were age and current physical activity. Age was associated with the preferred mode of physical activity (P G .001), interest in receiving information on physical activity (P = .002), and mode of delivery of information (P = .044). Current physical activity was associated with

preferred mode of physical activity (P = .028), interest in increasing physical activity (P = .019), when to start a physical activity program (P = .028), interest (P = .007) and ability (P = .002) to do a physical activity program, location of physical activity (P G .001), and mode of delivery of information (P = .008).

For medical variables, months since diagnosis was associated with mode of information delivery (P = .047) and preferred location of physical activity (P = .033). Surgery was associated with preferred location of physical activity (P = .022). Chemotherapy was associated with interest in a program that increases physical activity (P = .013), interest to receive physical activity information (P = .001), and mode of delivery of physical activity information (P = .011). Radiation therapy was associated with preference for whom to receive information from (P = .021) and location of physical activity (P = .045). Cancer status was associated with preferred mode of delivery (P = .037) and location of physical activity (P = .038), whereas cancer site was associated with the preferred mode of physical activity (P < .001).

Discussion

Previous studies examining physical activity preferences in cancer survivors have generally focused on disease-specific cancer survivor groups

including endometrial,[15] brain,[16] non-Hodgkin lymphoma,[14] ovarian,[13] bladder,[17] rural breast cancer,[19] head and neck cancer,[20] and mixed diagnoses,[21] resulting in very few young-adult cancer survivors being included in this research. In the present study, most young-adult cancer survivors indicated an interest in physical activity programming and felt like they would or might be able to participate in such a program. These findings are consistent with previous research in other cancer survivor groups.[13,15,17] These results are important because they indicate a strong interest in physical activity programming for young-adult cancer survivors, yet there is very little physical activity programming specifically for this population either within the cancer care setting or outside in the community.

The most common preferences for physical activity counseling were to receive information from a fitness expert of our sample as well as its representativeness compared with nonresponders.[4] In brief, the mean age of the participants was 38.2 (SD, 5.6) years; 70% were female; mean months since diagnosis was 73.6 (SD, 52.1); 73% were married; and 62% had completed university/college. The mean body mass index was 26.5 (SD, 5.7) kg/m^2, with 53% of the sample being overweight or obese. The most common cancers were breast (23%), thyroid (14%), and lymphoma (12%). At the time of the survey, 87% of participants were disease-free, and 51%

were meeting public health physical activity guidelines. Our sample was similar in age, surgery rate, time since diagnosis, and most cancer types compared with nonresponders but slightly overrepresented women, breast cancer, chemotherapy rate, and radiation therapy rate.[8]

Physical Activity Programming and Counseling Preferences

Physical activity counseling preferences are displayed in Table 1. Most young-adult cancer survivors either preferred or maybe preferred to have received information about physical activity at some point after their diagnosis (81%) and would have liked to receive that counseling from a fitness expert at a cancer center (50%), by brochures/print materials (64%), face-to-face (47%), or e-mail (46%).

Moreover, most young-adult cancer survivors felt they would be able or maybe able (88%) and interested or maybe interested (78%) in doing a physical activity or sports program for young- adult cancer survivors (Table 2). Participants also indicated their most common preference was to start a physical activity program 3 to 6 months after treatment (34%), with 64% preferring to start the program sometime after treatment. Most young-adult cancer survivors did not have a preference for whom to do their physical activity with (35%), although a plurality preferred family/friends (32%), and only 17% preferred to do physical activity alone. Most young-adult

cancer survivors preferred to do their activity outside around their neighborhood (46%). Many participants were interested or maybe interested in receiving a physical activity program that would help them increase their physical activity level (86%). Walking was the preferred type of physical activity in both the from the cancer center, representing nearly half the sample, which is consistent with other cancer survivors.[15Y17,19] Interestingly, the oncologist was the second most common preference, which is consistent with research in bladder[17] and endometrial[15] cancer survivors but higher than for breast[19] and mixed cancer survivors.[21] This finding suggests a possible role of the oncologist in physical activity counseling for young- adult cancer survivors, although the feasibility of such a role is unclear. Interestingly, few young-adult cancer survivors preferred physical activity counseling from nurses, even though for performing physical activity. This information could prove to be very beneficial when planning a physical activity intervention to increase physical activity in young-adult cancer survivors not currently doing physical activity.

Age was also an important factor that modified some of the physical activity preferences of young-adult cancer survivors. Specifically, younger adult cancer survivors were more interested in receiving physical activity information and more likely to prefer to receive that information by

electronic format (ie, e-mail or Internet). ''Younger'' young-adult cancer survivors may be more comfortable in using e-mail and the Internet more than ''older'' young-adult cancer survivors, which may be why they would prefer those sources of information delivery. Recent evidence demonstrates that adolescents and young adults are comfortable and willing to use the Internet for health information and support.[22] The most profound age difference, however, was for type of activity. Only 18% of young-adult cancer survivors in their 20s preferred walking compared with 35% in their 30s and 61% in their 40s. These data suggest a steep gradient between age and preference for walking such that walking programs are unlikely to attract many younger adult cancer survivors.

Two other particularly large differences in preferences are worth noting. Almost half of female young-adult cancer survivors (49%) preferred walking, whereas only 19% of males preferred walking. These data suggest that walking may be a good option for promoting physical activity in young-adult female cancer survivors but might not appeal to very many young-adult male survivors. The other large difference was that participants with existing disease were much less likely to want to receive physical activity information by electronic means (ie, e-mail and Internet). It is possible that young-adult cancer survivors with existing disease may prefer more face-to-face attention to ensure that their individual medical concerns

are addressed. Consequently, Internet-based physical activity pro- grams may be most appropriate for young-adult cancer survivors who are disease-free with fewer medical concerns.

Our study has important implications for cancer nursing. Understanding the physical activity preferences of young-adult cancer survivors may allow nurses to provide practical recommendations for physical activity that could potentially enhance motivation and improve long-term health outcomes. A caveat, however, is that if nurses wish to play a direct role in physical activity promotion, some level of training may be needed to convince cancer survivors that nurses possess the required expertise and are a reliable source of physical activity information. Nevertheless, even if nurses do not wish to play a direct role in physical activity counseling, an understanding of preferences can assist in making appropriate referrals to clinical and community-based programs. Finally, many cancer centers now have specific facilities and programs for young-adult cancer survivors that are multidisciplinary and will likely offer physical activity programs. The nurses involved in these programs will benefit by knowing the physical activity preferences that are important to young-adult cancer survivors.

Our study has important strengths and limitations. To the best of our knowledge, our study is the first to focus on physical nurses may be better

positioned to provide such counseling. Perhaps young-adult cancer survivors do not perceive nurses as having the necessary technical expertise or qualifications for counseling about physical activity. Consequently, if nurses are to play a greater role in physical activity promotion in the oncology setting, this perception will need to be changed by providing oncology nurses with training in physical activity interventions and educating cancer survivors about this new role for nurses.

Taken together, these counseling findings suggest that, for young-adult cancer survivors, receiving physical activity counseling that is tied closely to cancer centers may be preferred when compared with physical activity counseling geared toward the general population. Young-adult cancer survivors also have unique concerns because of their cancer diagnosis and treatment that they may feel need to be addressed when considering physical activity. This highlights the need for cancer centers to adopt physical activity counseling services for young-adult cancer survivors and not to assume they would be willing to attend services available in the community to the general population.

In terms of programming preferences, we found that young- adult cancer survivors were most interested in starting a physical activity program after treatment, similar to several other cancer survivor groups.[14,15,20] The major moderator of this finding was current physical

activity. Young-adult cancer survivors not currently doing physical activity were even more likely to prefer to start physical activity posttreatment. This makes sense because maintaining physical activity during treatment is likely feasible, whereas adopting physical activity during treatment may be viewed as more daunting.

Only 17% of young-adult cancer survivors preferred to do physical activity alone. This contrasts with other studies where the most common preference was to do physical activity alone.[14,15] More than half of young-adult cancer survivors actually preferred to do physical activity at a community fitness center. This is also different from other cancer survivor groups where most survivors prefer to do a physical activity program at home. These results are important to note and could be due to the more peer- oriented, social nature of young-adult cancer survivors when compared with older cancer survivors. This is important to take into consideration when planning and promoting physical activity interventions for young-adult cancer survivors.

Current physical activity level was the variable that most consistently modified the physical activity preferences of young- adult cancer survivors. Young-adult cancer survivors who did not meet the public health physical activity guidelines were more likely to prefer walking, more likely to be interested in a program to increase activity levels, more likely to

prefer to start after diagnosis, more likely to prefer to receive information via brochures, more likely to prefer to do activity at home, less interested in doing an activity program, and less likely to feel able to do a program. A particularly pronounced difference was found for the preferred location of exercise. Specifically, 51% of participants not meeting the public health physical activity guidelines preferred to do physical activity at home compared with only 36% of those meeting the guidelines. These differences may have to do with their comfort level and self-efficacy. Moreover, we obtained a large, random, population-based sample of young-adult cancer survivors from a comprehensive registry in Alberta, Canada. Limitations of our study include the self-report measures of physical activity and medical variables and the modest response rate that resulted in a sample of young-adult cancer survivors that slightly underrepresented younger, male, and long-term survivors. Despite these limitations, our study provides the first data on physical activity preferences in young- adult cancer survivors.

In summary, the results of this study indicate that young- adult cancer survivors have an interest in receiving physical activity programming and counseling. In general, young-adult cancer survivors seem to be most interested in a physical activity program performed at a community fitness center, with friends and family, and starting after treatment. The most consistent moderators of these findings were age and

current physical activity. Our findings are important because they can be used to design specific physical activity programming for young-adult cancer survivors that may optimize motivation and long-term health outcomes. Further studies are needed to determine if tailoring physical activity programs to young-adult cancer survivors' preferences, such as Internet interventions, is indeed associated with better adherence and improved health outcomes in young-adult cancer survivors.

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Table 1. Descriptive statistics for physical activity counseling preferences of young adult cancer survivors in Alberta, Canada, 2008.

Preferences	Number Responded	Percent (%)
Liked to have received physical activity information at some point after diagnosis? (n=569)	294	51.7
Yes	111	19.5
No	164	28.8
Maybe		
Who would you have liked to receive physical activity information from? (n=552)	274	49.6
Fitness expert from cancer centre	95	17.2
Oncologist	76	13.8
Community fitness expert	43	7.8
Physiotherapist from cancer centre	36	6.5
Cancer support group	16	2.9
Nutritionist from cancer centre	12	2.2
Nurse		
* How would you like to receive information about physical activity? (n=564)	358	63.5
Brochures/print material	266	47.1
Face-to-face	259	45.9
By e-mail	217	38.4
On the internet	85	15.0
Self help video	63	11.1
Telephone		

* could check more than one response.

Table 2. Descriptive Statistics for physical activity programming preferences in young adult cancer survivors in Alberta, Canada, 2008.

Preference variable	Number Responded	Percent (%)
Able to do a physical activity program for young adult cancer survivors? (n=569)	354	62.2
Yes	71	12.5
No	144	25.3
Maybe		
Would be interested in doing a activity or sports program for young adult cancer survivors? (n=567)	272	48.0
Yes	123	21.7
No	172	30.3
Maybe		
When would you have liked to have started an activity program? (n=547)	141	25.8
At the time of diagnosis	55	10.1
During treatment	91	16.6
Right after treatment	183	33.5
3-6 months after treatment	77	14.1
At least 1 year after treatment		
Who would you prefer to do activity with? (n=569)		
Family/Friends	180	31.6
Other cancer survivors	96	16.9
Alone	95	16.7
No preference	198	34.8
*Where would you prefer to do an activity or sport program? (n=570)	264	46.3
Outside around my neighborhood	248	43.5
At home	305	53.5
At a community fitness centre	64	11.2
At a cancer centre		
Would you be interested in a program that would increase your activity level? (n=570)	346	60.7
Yes	79	13.9
No	145	25.4
Maybe		
Favorite activity or sport in the winter (listed as top 3) (n=501)	201	40.1
Walking	164	32.7
Skiing	127	25.3
Team Sports	95	19.1
Gym Workout	87	17.4
Skating	78	15.6
Swimming	63	12.6
Running		
Favorite activity or sport in the summer? (listed as top 3) (n=536)	275	51.3
Walking	178	33.2
Biking	139	25.9
Swimming	115	21.5
Team sports	101	18.9
Golf	93	17.3
Running	83	15.4
Hiking	54	10.1

Gym Workouts		
Current member of fitness centre (n = 576)		
Yes	176	30.5
No	400	69.4
Own home exercise equipment (n = 577)		
Yes	363	62.9
No	214	37.1
Access to the internet (n=577)		
Yes	553	95.8
No	24	4.2

* could check more than one response.

Table 3. Summary of the associations between demographic variables and physical activity preferences in young adult cancer survivors in Alberta Canada (2008).

Demographic Variable	Physical activity preferences with significant associations
Younger survivors in their 20s compared with survivors in their 30s and 40s were:	Less likely to prefer walking (18% vs. 35% vs. 61%; $p<0.001$), more interested in receiving information (94% vs. 84% vs. 76%; $p=0.002$), and more likely to prefer to receive information by email (61% vs. 47% vs. 42%; $p=0.044$) and internet (47% vs. 44 % vs. 31%; $p=0.006$).
Female survivors compared to male survivors were:	More likely to prefer walking (49% vs. 19%, $p<0.001$).
Married survivors compared to unmarried survivors were:	More likely to prefer walking (43% vs. 32%; $p=0.033$) and to feel able to do an activity program (89% vs. 83%; $p=0.048$).
Survivors with a college degree compared to survivors with less than a college degree were:	More likely to prefer to receive information via email (49% vs. 40%, $p=0.031$), face to face counseling (51% vs. 41%; $p=0.024$), and to do activity outside in their neighborhoods (52% vs. 37%; $p=0.001$).
Obese survivors when compared to overweight and normal weight survivors were:	More likely to prefer walking (51% vs. 39% vs. 36%; $p=0.027$) and more interested in a program to increase their activity level (90% vs. 89% vs. 82%; $p=0.040$).
Survivors with an annual income less than $100,000 compared with survivors with an income more than $100,000 were:	More likely to prefer walking (43% vs. 33%; $p=0.042$), less likely to be able to do an activity program (85% vs. 93%; $p=0.008$), and less likely to prefer information received via internet (35% vs. 46%; $p=0.015$).
Survivors that were employed full time compared to survivors not working full time were:	Less likely to prefer walking (34% vs. 48%; $p=0.002$) and to receive information via brochures (60% vs. 68%; $p=0.049$).
Survivors not meeting public health physical activity guidelines compared with survivors meeting public health physical activity guidelines were:	More likely to prefer walking (52% vs. 45%; $p=0.028$), more likely to be interested in a program to increase activity levels (90% vs. 83%; $p=0.019$), more likely to prefer to start after diagnosis (69% vs. 60%; $p=0.028$), more likely to prefer to receive information via brochures (69% vs. 58%; $p=0.008$), more likely to prefer to do activity at home (51% vs. 36%; $p<0.001$), less interested in doing an activity program (74% vs. 83%; $p=0.007$), and less likely to feel able to do a program (83% vs. 92%; $p=0.002$).

Table 4. Summary of the associations between medical variables and physical activity preferences in young adult cancer survivors in Alberta, Canada (2008).

Medical Variables	Physical activity preferences with significant associations
Survivors within 60 months of their diagnosis compared with survivors beyond 60 months of their diagnosis were:	More likely to prefer face to face counseling (50% vs. 42%; p=0.047) and to do activity at a community fitness centre (57% vs. 48%; p=0.033).
Survivors treated with surgery compared to survivors not treated with surgery were:	More likely to want to do activity at home (54% vs. 41%; p=0.022).
Survivors treated with chemotherapy compared to survivors not treated with chemotherapy were:	More likely to be interested in a program to increase their activity level (90% vs. 82%; p=0.013), to want to receive information (86% vs. 75%; p=0.001), and to prefer face to face counseling (52% vs. 41%; p=0.011).
Survivors treated with radiation therapy compared to survivors not treated with radiation therapy were:	More likely to prefer to receive information from a fitness expert in the cancer centre (54% vs. 44%; p=0.021) and less likely to prefer to do activity in a community fitness centre (50% vs. 58%; p=0.045).
Survivors with existing disease compared with survivors who were disease-free were:	Less likely to prefer to receive information via email (34% vs. 48%; p=0.037), or internet (24% vs. 41%; p=0.009) and more likely to want to do activity at home (45% vs. 35%; p=0.038).
Survivors with breast cancer compared to thyroid cancer and other cancers were:	More likely to prefer walking (51% vs. 51% vs. 33%; p<0.001).

Chapter 3

Determinants of physical activity in young adult cancer survivors

A version of this chapter has been accepted for publication. Belanger LJ, Plotnikoff RC, Clark A, Courneya KS. Determinants of physical activity in young adult cancer survivors. American Journal of Health Behavior. 2012; 36(4):483-94.

Approximately 10,000 adults between 20 and 44 years of age are diagnosed with cancer each year in Canada,[1] and over 100,000 are diagnosed in the United States.[2] A cancer diagnosis as a young adult may be particularly devastating because of the potential to spend decades living with the psychological, physical, reproductive, social, and spiritual effects of the disease and its treatments.[1] To reduce the risk of secondary health conditions such as cardiovascular disease, diabetes, or secondary cancers and to improve quality of life (QoL), the American Cancer Society[3] and the American College of Sports Medicine[4] recommend a physically active lifestyle for cancer survivors based on research suggesting physical activity (PA) improves QoL in many cancer survivor groups[5-9] including young adult cancer survivors (YACS).[10]

We previously conducted a population-based survey of YACS in Alberta, Canada, and reported a strong dose-response association between achieving the PA guidelines and health-related QoL, depression, stress, and self-esteem. Unfortunately, about half of YACS in this study were not meeting public health PA guidelines and almost a quarter were completely sedentary.[10] In another exploratory survey of 60 YACS, only 10% reported moderate PA levels consistent with recommendations, and 32% reported vigorous PA levels consistent with recommendations.[11] The younger age and the diverse disease and

treatment-related factors in YACS may be novel determinants of PA and/or they may amplify or nullify the associations of other previously established determinants. Indeed, previous studies have shown that the determinants of PA may vary depending on the cancer survivor group and age.[12] For example, bladder cancer[13] survivors were more likely to engage in PA if they were not receiving adjuvant therapy. Ovarian cancer survivors[14] were more likely to engage in PA if they had a lower fat mass, absence of arthritis, longer time since diagnosis, and were disease free. Both ovarian and bladder cancer survivors were more likely to engage in PA if they were younger and had earlier stage of disease. The purpose of the present study was to identify the key demographic, medical, and social cognitive determinants of PA in YACS.

To guide our investigation, we used the theory of planned behavior (TPB)[15] and included demographic and medical variables. The TPB is a social cognitive model of human behavior that proposes that intention (ie, how hard one is willing to try) is the key determinant of behavior. Intention, in turn, is influenced by perceived behavioral control (PBC; controllability over the behavior), self-efficacy (confidence in performing the behavior), instrumental attitude (expected benefits of performing the behavior), affective attitude (expected enjoyment in performing the behavior), injunctive norm (anticipated support from important people for performing the behavior), and descriptive norm (the extent to which important people perform the behavior themselves). In addition, planning (detailed plan on how to accomplish the behavior) has been proposed as a critical variable for translating intentions into behavior.[16] We chose

the TPB over other social cognitive models because of its extensive testing in exercise studies with cancer survivors[17] and its emphasis on intentional behavior and multidimensional attitude.

Based on previous literature, we hypothesized that age and health status would be negatively associated with PA. Based on theoretical tenets of the TPB, we hypothesized that intention and planning would be the most important correlates of PA. Intention, in turn, was hypothesized to be most strongly associated with affective attitude, instrumental attitude, and PBC. We also expected that the TPB would mediate any associations between the demographic/medical variables and PA. Our secondary purpose was to identify the key salient PA beliefs of YACS that might be targeted in future PA interventions.

METHODS

Participants and Procedures

The Alberta Cancer Research Ethics Committee and the University of Alberta granted ethical approval to conduct a postal survey of selected 2000 YACS identified through the Alberta Cancer Registry. Eligibility for the study included being (1) diagnosed with invasive cancer in Alberta between the ages of 20-44 and (2) still currently between the ages of 20 and 44 and living in Alberta, Canada. The 2000 YACS were randomly selected by a computerized program from approximately 5000 YACS who met the eligibility criteria. The survey (Appendix C) was conducted by the Alberta Cancer Registry on behalf of the

investigators and followed a modified total design method.[18] In the initial mailed materials, prospective participants received (1) a letter of invitation from the registry explaining the general purpose of the registry and its role in this particular study, (2) a letter from the investigators explaining the study, and (3) a copy of the survey. A postcard reminder was mailed 3-4 weeks later, and a second survey was mailed 3-4 weeks after that to nonresponders. The modification to the total design method was the elimination of the telephone follow-up of nonresponders because our ethics board deemed it to be too intrusive for this target population. Additional details of the study procedures are available in papers that reported the QoL data[10] and PA preference data[19] from this survey. This same survey included the TPB data for this study.

Measures

Medical and demographic information was collected by self-report and included age, sex, education, annual family income, current employment status, race, current smoking and drinking status, general health, comorbidities, height and weight to calculate body mass index (BMI), time since diagnosis, type of cancer, disease stage (advanced vs early), treatments received (no vs yes), current treatment status (on vs off treatment), recurrence of cancer (no vs yes), and current disease status (disease-free vs existing disease).

Physical activity. The Leisure Score Index (LSI) from the Leisure-Time Exercise Questionnaire[20] was used to assess the average weekly frequency and was modified to include specific duration of PA over the past month in 3 separate

intensity categories: light (minimal effort, no perspiration), moderate (not exhausting, light perspiration), and vigorous (rapid heartbeat, sweating). An evaluation of the Leisure-Time Exercise Questionnaire found a 1-month test-retest reliability of 0.62 and concurrent validity coefficient of 0.32 with an objective indicator of PA (ie, an accelerometer).[21] The percentage of participants meeting the public health PA guidelines was calculated based on the 2008 Physical Activity Guidelines for Americans,[22] which have been endorsed for cancer survivors by the American College of Sports Medicine[4] and the American Cancer Society.[3] These guidelines suggest that individuals should obtain 75 minutes of vigorous activity per week, 150 minutes of moderate activity per week, or an equivalent combination that double-weights the vigorous minutes. We computed PA minutes as moderate-minutes-plus-2 times the vigorous minutes. Participants were then divided into the following 4 categories based on the PA guidelines: (1) completely sedentary (no moderate or vigorous PA), (2) insufficiently active (some PA but less than 150 PA minutes/week), (3) within guidelines (150 to 300 PA minutes/week), and (4) above guidelines (≥ 300 minutes of PA /week).

Theory of Planned Behavior. The TPB constructs were assessed based on Ajzen's recommendations of using 7-point Likert scales ranging from 1 (strongly/extremely negative) to 4 (neutral) to 7 (strongly/extremely positive).[23] Items were included that assessed attitude (instrumental and affective), subjective norms (injunctive and descriptive), PBC, intentions, and planning. Each TPB variable was assessed by 2 items with the exception of descriptive norm and

planning, which were assessed by single items. The alpha coefficients for the multi-item scales were as follows: intention (α =.93), affective attitude (α=.82), instrumental attitude (α =.66), injunctive norm (α =.92), and PBC (α =.73).

Examples of the items are as follows. Intention: "How motivated are you to exercise over the next 12 weeks?" PBC: "Do you feel you would have complete control over whether or not you exercised over the next 12 weeks?" Instrumental attitude: "I think that exercising over the next 12 weeks would be… (eg, extremely harmful to extremely beneficial)." Affective attitude: "I think that exercising over the next 12 weeks would be… (eg, extremely unenjoyable to extremely enjoyable)." Injunctive norm: "I think that if I exercised over the next 12 weeks, most people who are important to me would be…(eg, extremely discouraging to extremely encouraging)." The descriptive norm item was "I think that over the next 12 weeks, most people who are important to me will themselves be…(eg, extremely inactive to extremely active)." The planning item was "Do you have plans for when, where and the type of exercise you will do in the next month?"

Open-ended items were included to solicit the most salient behavioral, normative, and control beliefs. For behavioral beliefs, we solicited separately for instrumental (what are the main benefits of PA?) and affective attitudes (what would make PA fun?). For normative beliefs, we solicited separately for injunctive (important people who would support respondents) and descriptive norms (important people who are doing PA themselves). For control beliefs we asked, "What factors make it more difficult for you to exercise?"

Data Analysis

All analyses were conducted using SPSS version 18 (SPSS Inc, Chicago, IL). The 4-category PA variable (ie, completely sedentary, insufficiently inactive, within guidelines, and above guidelines) was used as the dependent variable. We dichotomized most demographic, medical, and behavioral variables to conserve power and facilitate interpretation. Chi-square tests (χ^2) were used to examine the associations between categorical medical, demographic, and behavioral variables and PA behavior. One-way ANOVAs were conducted to examine differences in social cognitive variables based on the PA categories. In addition, bivariate correlations using Pearson product moment correlation coefficients were used to evaluate linear associations among the determinants and PA behavior prior to inclusion in the path analysis.

To test the primary hypotheses and determine the independent correlates of PA behavior, we conducted path analysis using the TPB constructs and the significant demographic, medical, and behavioral variables. Seven separate multiple regression analyses were conducted beginning with PA behavior being regressed on all TPB variables and the significant demographic, medical and behavioral variables. The next most immediate correlates of PA behavior (planning/intention) were then regressed on the remaining TPB constructs and the significant medical, demographic, and behavioral variables. Finally, the individual TPB variables were regressed on the significant medical, demographic, and behavioral variables. We tested all paths, but included only statistically significant

pathways (P<.05) with standardized beta coefficients of ≥ 0.10 in the final diagram. The open-ended responses to the most salient beliefs were reported as frequency counts as well as the % of survivors (ie, the entire sample) and the % of respondents (ie, those who provided a response to the belief questions) providing the response.

RESULTS

Briefly, of the 2000 mailed surveys, 588 surveys were returned completed, and 460 were returned because of a wrong address, resulting in a 29% completion rate (588/2000) and a 38% response rate (588/1540), excluding the wrong addresses. The mean age of the participants was 38.2 ±5.6, 70% were female, mean months since diagnosis was 73.6 ± 52.1, 73% were married, and 62% had completed university/college. The mean BMI was 26.5 ± 5.7 with 53% of the participants being overweight or obese (BMI >25). The most common cancers were breast (23%), thyroid (14%), and lymphoma (12%). At the time of the survey, 87% of participants were disease free, and 51% were meeting public health PA guidelines. Based on available registry data, we found that our sample was similar in age, surgery rate, time since diagnosis, and most cancer types compared to nonresponders but slightly overrepresented women, breast cancer, chemotherapy treatment rate, and radiation therapy treatment rate.[10]

Univariate Analyses of Physical Activity Correlates

Table 1 reports the demographic and behavioral correlates of PA. Participants who were younger (P=0.028), more educated (P<0.001), wealthier (P=0.004), and nonsmoking (P=0.017) were more likely to be active. Table 2 reports the medical correlates of PA. Participants who had better general health (P<0.001), reported fewer comorbidities (P= 0.035), and had a lower BMI (P=0.017) were more likely to be active. Table 3 reports the TPB correlates of PA. All TPB constructs were significantly associated with PA (Ps<0.001).

Multivariate Path Analysis of Physical Activity Correlates

All TPB variables were included in the path analysis along with the significant univariate predictors of age, education, smoking, general health, comorbidities, and BMI. Income was excluded from the path analysis because of the amount of missing data (n = 34). The final path model is presented in Figure 1. Briefly, the overall model explained 38% of the variance in PA (P<.001) with planning, intention, affective attitude, general health, and education having significant independent associations with PA. The second regression model explained 67% of the variance in planning (P<.001) with intention providing the only independent association. For intention, the model explained 56% of the variance (P<.001) with PBC, affective attitude, and instrumental attitude having significant independent associations. Smoking and BMI are not represented in Figure 1 because they had no significant associations with any variables in the model.

The most common salient PA beliefs of YACS are presented in Table 4. The top 3 most common beliefs in each category were controlling weight control, being fit/healthy, and improving energy for instrumental beliefs (benefits); exercising with a friend/partner, listening to music, and doing a variety of exercises for affective beliefs (enjoyment); friends, spouse/partner, and family for injunctive beliefs (approval); friends, spouse/partner, and children for descriptive beliefs (others who exercise); and lack of time, family responsibilities, and work responsibilities/schedule for control beliefs (barriers).

Discussion

We found several common demographic, medical, and behavioral variables to be associated with PA levels in YACS. Most of these associations, however, were mediated by the TPB. Overall, the TPB explained 38% of the variance in PA with intention being the strongest independent correlate. The model explained 56% of the variance in intention based on significant independent associations with PBC, affective attitude, and instrumental attitude. Finally, we identified the key salient beliefs about PA that may be targeted in PA interventions in YACS.

Age, income, and education were associated with PA levels, which is consistent with the literature in cancer survivors.[13,14,24-27] Even though age in other studies on cancer survivors was associated with PA, very few of these studies included YACS. It is noteworthy that even within this restricted young adult age-group, age still had a significant association with PA. Specifically, PA declined

from the 20s to 30s to 40s. These data suggest that YACS who are older, less educated, and less wealthy may particularly benefit from PA promotion interventions.

In terms of medical and health variables, general health, comorbidities, and body mass index were associated with PA in YACS. Again, these associations are consistent with research into other cancer survivor groups[12,14,24]; however, few studies have demonstrated these associations in a younger adult cohort. These findings are important given the restricted age range of YACS and the fact that these health issues are commonly associated with older age. Consequently, even in YACS, PA interventions may be particularly needed for those who are obese, have comorbidities, and have poorer general health.

Overall, the TPB explained 38% of the variance in PA, with intention being the strongest independent correlate. Planning, affective attitude, general health, and education also provided modest independent contributions. These findings are not entirely consistent with the TPB, which proposes no direct associations between external variables and PA independent of the TPB variables. Nevertheless, similar findings have been reported previously.[13,14] Our study does support the central role of intention and suggests that PA interventions targeting YACS should focus on strengthening intentions and developing detailed planning. Intention provides the motivation and general direction for behavior whereas planning provides the detailed action plans for how the behavior will be completed.

The TPB explained 56% of the variance in intention with significant independent contributions from PBC, affective attitude, and instrumental attitude. Indeed, PBC was the strongest correlate of intention, followed by equal contributions from affective attitude and instrumental attitude. These findings are consistent with previous literature in cancer survivors,[12-14,24-27] which indicates PBC and attitude as the main correlates of PA intention. This suggests that the TPB is particularly useful for understanding why YACS intend to be active. One might have expected a stronger role for subjective norms in the YAC population given their greater emphasis on social support and peer interaction. Specifically, YACS indicated they would participate in PA with friends/family,[19] which contrasts other cancer survivor groups who prefer to do PA alone.[12,24] Nevertheless, injunctive and descriptive norms were both strongly associated with PA in univariate analyses but not in the path analysis. This finding suggests that norms may influence PA in YACS through other TPB constructs such as affective attitude (ie, making it more enjoyable) or PBC (ie, increasing confidence and controllability). Future PA interventions should address all TPB constructs with particular focus on building confidence; making PA enjoyable, and ensuring YACS understand the unique benefits of PA.

In terms of variables external to the TPB, general health may be the most important factor for understanding PA in YACS. General health was associated with all 3 TPB constructs that directly related to intention (PBC, affective attitude, and instrumental attitude) and was the only variable associated with PBC and affective attitude. Moreover, general health was also associated with PA

independent of the TPB. This suggests that YACS in better general health may be more able and willing to do PA.

Researchers and practitioners may need to consider the general health of YACS when planning a PA intervention given its direct association with PA as well as its influence of the key TPB correlates of intention.

This study is the first in cancer survivors to separate the behavioral beliefs into instrumental and affective. When compared to previous studies in adolescent (mean age 17 years),[26] endometrial (mean age 65 years),[24] and non-Hodgkins lymphoma (mean age 61 years)[12] cancer survivors, there were many similarities in the instrumental beliefs. All survivor groups indicated that controlling weight, being fit/healthy, and improving strength were among the most common anticipated benefits of PA. YACS also listed improved energy, stress reduction, improved endurance, better mood/mental health, and better sleep. These beliefs may be the key targets when attempting to improve the instrumental attitudes of YACS. In terms of affective beliefs, YACS indicated that exercising with a friend/partner, listening to music, and doing a variety of exercises would make PA enjoyable. These beliefs may be the key targets when attempting to improve the affective attitudes of YACS.

In terms of normative beliefs, there appeared to be differences that may be related to different relationship priorities across different age-groups. For YACS, the most important people are friends, spouse/partner, children, family, and coworkers. This contrasts with adolescent cancer survivors,'[26] who list friends, family, and parents but omit spouse/partner, coworkers, and children. Conversely,

endometrial survivors list friends, spouse/partner, family, and children but not coworkers or parents, as the majority of endometrial survivors [24] were not working (68%) and the mean age was 65 years. Consequently, YACS have the potential to have their PA influenced by a broader range of social network spanning both parents and children and including coworkers and friends.

For control beliefs, there were many beliefs that were similar to those of other cancer survivor groups including lack of time, no motivation, lack of sleep, bad weather, and lack of access.[12,24,26] Unique to YACS were the combined listing of family and work responsibilities. Again, this finding is not surprising given the life stage of YACS, which may include a young, dependent family and an early career stage with substantial work responsibilities. Conversely, adolescents are likely not to have begun their careers or have children, and older cancer survivors are more likely to have retired and have their children grown up.

Our findings should be interpreted in the context of the study's strengths and limitations. The strengths of our study include the adoption of a validated theoretical framework, the comprehensive assessments of PA correlates, the large and randomly selected sample from a provincial registry, and the validated measures of PA and TPB. The limitations of our study include the cross-sectional design that limits the ability to infer causation, the self-report measures of PA and medical variables that may reduce validity, and the modest response rate that limits generalizability. Moreover, our sample slightly overrepresented women, breast cancer, and chemotherapy and radiation treatment rates and likely was biased towards more functional and healthy YACS interested in PA. These biases

likely result in an overestimate of the number of YACS meeting PA guidelines and higher scores on the TPB variables. Nevertheless, the associations between the TPB and PA identified in the present study are still likely reflective of the general population.

In conclusion, the TPB appears to be a useful framework for understanding PA in YACS. Our study provided evidence that PA is strongly associated with intention, which, in turn, was strongly associated with PBC, instrumental, and affective attitude. These data identify important targets for PA interventions in YACS including intentions, planning, PA benefits, PA enjoyment, and PBC. Moreover, we identified the key PA beliefs of YACS that are critical to informing PA interventions. Based on these beliefs, PA interventions in YACS may focus more on the immediate benefits of PA (weight control; improved energy, endurance, and strength) as opposed to more distant benefits (eg, longer independent living or prevention of osteoporosis). Moreover, when designing PA interventions for YACS, a strong social component should be encouraged as participants indicated they prefer exercising with friends/partners and list friends most often when asked who would support them doing PA and who is currently doing PA. Time management might also be addressed as it was the most salient barrier to PA. Finally, interventions should also take account the general health, comorbidities, age, and education of YACS as these factors may influence PA and the TPB beliefs. Interventions that increase PA in YACS will likely improve quality of life and may even improve disease outcomes

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Table 1: Percentage of participants meeting physical activity guidelines based on demographic and behavioral variables in young adult cancer survivors, Alberta, Canada, 2008 (N = 588).

Demographic Variables	Sedentary	Insufficiently Active	Within Guidelines	Above Guidelines	P (X^2)	P (r)
Gender						
Male (n =174)	27.6%	23.0%	14.9%	34.5%		
Female (n =414)	21.7%	26.1%	25.4%	26.8%	0.013	0.928
Age						
20-29 (n =52)	15.4%	23.1%	23.1%	38.5%		
30-39 (n =236)	22.0%	28.4%	19.5%	30.1%		
≥ 40 (n=300)	26.0%	23.0%	24.3%	26.7%	0.510	0.028
Ethnic origin						
White (n =514)	22.2%	25.5%	21.6%	30.7%		
Other (n =74)	32.4%	23.0%	27.0%	17.6%	0.780	0.419
Marital status						
Married (n =428)	24.3%	25.2%	21.3%	29.2%		
Not Married (n =160)	21.3%	25.0%	25.0%	28.8%	0.752	0.578
Education						
<postsecondary (n =224)	32.6%	31.2%	14.7%	21.4%		
Postsecondary (n=364)	17.9%	21.4%	26.9%	33.8%	<0.001	<0.001
Income ($ can)						
<100,000 (n =357)	24.1%	26.9%	23.2%	25.8%		
≥100,000 (n =197)	17.3%	22.3%	23.9%	36.5%	0.032	0.004
Employment status						
Not full time (n=239)	25.1%	25.1%	23.8%	25.9%		
Full time (n =349)	22.3%	25.5%	21.2%	31.2%	0.518	0.264
Smoking						
Never (n = 371)	21.6%	24.3%	22.1%	32.1%		
Ex smoker (n = 143)	21.0%	31.5%	24.5%	23.1%		
Regularly (n = 74)	37.8%	17.6%	18.9%	25.7%	0.017	0.017
Alcohol consumption						
Never (n = 153)	24.8%	28.8%	22.2%	24.2%		
Socially (n = 435)	23.0%	23.9%	22.3%	30.8%	0.403	0.157

Sedentary = 0 min/wk; insufficiently active = 1-149.9 min/wk; within guidelines = 150-299.9; above guidelines= ≥ 300 min/wk.

Table 2: Percentage of participants meeting physical activity guidelines based on general medical and cancer variables in young adult cancer survivors, Alberta, Canada, 2008 (N = 588).

Medical Variables	Sedentary	Insufficiently Active	Within Guidelines	Above Guidelines	P X^2	P(r)
Cancer site						
Breast (n = 137)	24.1%	25.5%	22.6%	27.7%		
Thyroid (n = 80)	21.3%	26..3%	25.0%	27.5%		
Other (n= 371)	23.7%	24.8%	21.6%	29.9%	0.990	0.773
Radiation therapy						
Yes (n = 307)	23.5%	25.4%	25.1%	26.1%		
No (n = 281)	23.5%	24.9%	19.2%	32.4%	0.231	0.473
Chemotherapy						
Yes (n = 314)	24.8%	24.2%	23.2%	27.7%		
No (n = 274)	21.9%	26.3%	21.2%	30.7%	0.679	0.473
Surgery						
Yes (n = 494)	23.1%	24.5%	22.9%	29.6%		
No (n = 94)	25.5%	28.7%	19.1%	26.6%	0.684	0.345
Current disease status						
Disease free (n = 514)	22.2%	26.1%	22.2%	29.6%		
Current disease (n = 74)	32.4%	18.9%	23.0%	25.7%	0.206	0.223
Months since diagnosis						
< 5 years (n = 376)	23.7%	25.0%	23.4%	27.9%		
≥5 years (n = 212)	23.1%	25.5%	20.3%	31.1%	0.777	0.694
General Health						
Poor/Fair (n = 102)	47.1%	22.5%	11.8%	18.6%		
Good (n = 214)	22.4%	34.1%	21.5%	22.0%		
Very good/Excellent (n = 272)	15.4%	19.1%	26.8%	38.6%	<0.001	<0.001
Co morbid Status						
0 co-morbidities (n = 415)	21.7%	22.9%	22.9%	31.1%		
≥1 co-morbidities (n= 173)	27.7%	20.8%	20.8%	24.3%	0.214	0.035
Body mass index (kg/m^2)						
< 25 (n = 203)	22.3%	23.0%	22.3%	32.4%		
25 to 29.9 (n = 259)	21.9%	25.7%	21.4%	31.0%		
≥30 (n = 138)	28.5%	29.3%	23.6%	18.7%	0.174	0.017

Sedentary = 0 min/wk; insufficiently active = 1-149.9 min/wk; active = 150-299.9; very active ≥ 300 min/wk

Table 3: Descriptive statistics and correlations for theory of planned behavior variables and meeting physical activity guidelines in young adult cancer survivors, Alberta, Canada, 2008 (N = 588).

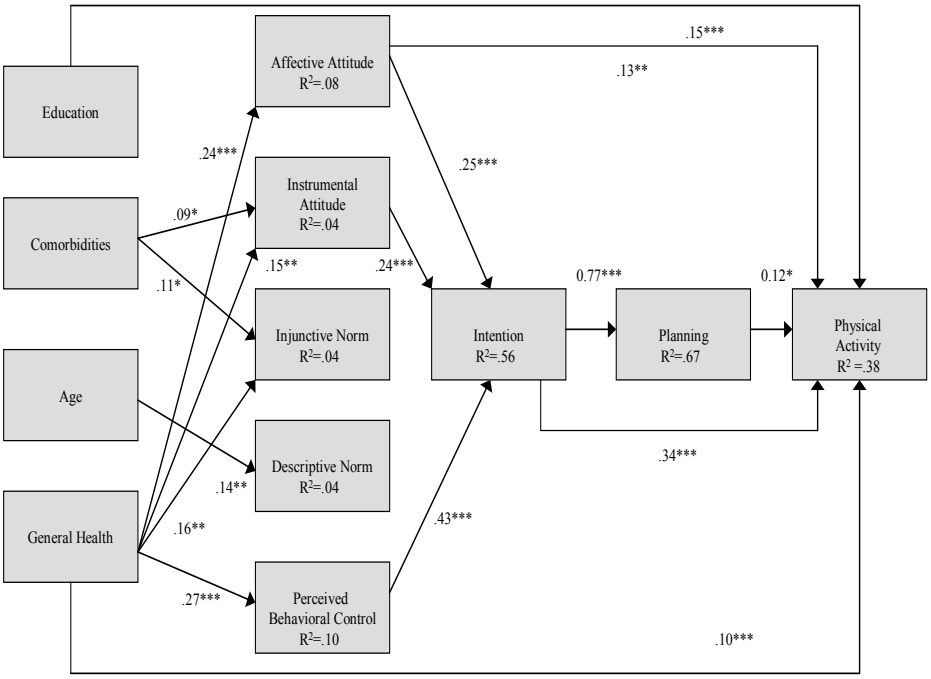
TPB Constructs	Sedentary	Insufficiently Active	Within Guidelines	Above Guidelines	P_{ANOVA}	P(r)
Affective attitude	4.9 (1.2)	5.2 (1.1)	5.6 (1.0)	5.9 (0.9)	<0.001	<0.001
Instrumental attitude	5.9 (1.0)	6.1 (0.9)	6.5 (0.6)	6.6 (0.6)	<0.001	<0.001
Injunctive norm	5.8 (1.0)	5.9 (1.0)	6.2 (0.8)	6.3 (0.7)	<0.001	<0.001
Descriptive norm	4.6 (1.6)	5.0 (1.7)	5.3 (1.4)	5.4 (1.4)	<0.001	<0.001
Perceived Control	4.8 (1.4)	5.0 (1.2)	5.6 (1.0)	6.0 (0.9)	<0.001	<0.001
Planning	3.3 (1.7)	4.2 (1.7)	5.1 (1.4)	5.7 (1.3)	<0.001	<0.001
Intention	3.9 (1.6)	4.6 (1.4)	5.7 (1.2)	6.1 (1.0)	<0.001	<0.001

Sedentary = 0 min/wk; insufficiently active = 1-149.9 min/wk; active = 150-299.9; very active ≥ 300 min/wk. TPB= Theory of planned behavior

Table 4. Most commonly reported behavioral , normative, and control beliefs concerning regular physical activity in young adult cancer survivors, Alberta, Canada, 2008.

	n	% survivors	% respondents
Most common behavioural beliefs (instrumental)		n=588	n=492
Weight control	222	38%	45%
Being fit/healthy	169	29%	34%
Improves energy	156	27%	32%
Improves endurance	99	17%	20%
Improves strength	87	15%	18%
Better health	81	14%	16%
Better mood/mental health	81	14%	16%
Feel better	69	12%	14%
Stress relief	68	12%	14%
Better sleep	38	6%	8%
Most common behavioral beliefs (affective)		n=588	n=441
Exercising with a partner/friend	213	36%	48%
Listening to music	95	16%	22%
Doing a variety of exercises	59	10%	13%
Seeing improvements	56	10%	13%
Socializing/meeting new people	37	6%	8%
Exercising with a group	34	6%	8%
Most common normative beliefs (injunctive)		n=588	n=465
Friends	263	45%	57%
Spouse/partner	253	43%	54%
Family	221	38%	48%
Children	99	17%	21%
Coworkers	76	13%	16%
Parents	31	5%	7%
Most common normative beliefs (descriptive)		n=588	N=366
Friends	203	35%	55%
Spouse/partner	118	20%	32%
Children	82	14%	22%
Family	70	12%	19%
Coworkers	58	10%	16%
Parents	50	9%	14%
Siblings	35	6%	10%
Most common control beliefs (barriers)		n=588	n=510
Lack of time	255	43%	50%
Family responsibilities	123	21%	24%
Work responsibility/schedule	116	20%	23%
No motivation	110	19%	22%
Lack of sleep/too tired	95	16%	19%
Bad weather/season	66	11%	13%
Lack of access	43	7%	8%

Figure 1. Path analysis of the correlates of physical activity in young adult cancer survivors in Alberta, Canada 2008.



Chapter 4

Prevalence, correlates, and psychosocial outcomes of sport participation in young adult cancer survivors

A version of this chapter has been accepted for publication. Belanger LJ, Plotnikoff RC, Clark A, Courneya KS. Prevalence, correlates, and psychosocial outcomes of sport participation in young adult cancer survivors. 2013; 14(2):298-304.

Young adult cancer survivors (YACS) between the ages of 20 and 44 face the potential of spending decades living with the psychological, physical, reproductive, social, and spiritual effects of the disease and its treatments (Marrett et al., 2002; Bleyer & Barr, 2009). Regular physical activity (PA) has been shown to improve health outcomes such as physical fitness, symptoms, psychosocial health, and fatigue in many cancer survivor groups (McNeely et al., 2006; Fong et al., 2012; Huang & Ness, 2011; Craft et al., 2012; Baumann et al., 2012; Szymlek-Gay et al., 2011) including YACS (Belanger et al, 2011). Consequently, the American Cancer Society (Byers et al, 2002; Rock et al., 2012) and the American College of Sports Medicine (Schmitz et al., 2010) have recommended a physically active lifestyle for cancer survivors to reduce the risk of secondary health conditions such as cardiovascular disease, diabetes, or secondary cancers and to improve quality of life (QoL).

A population-based survey of YACS in Alberta, Canada, previously reported a strong dose-response association between meeting the PA guidelines and health-related QoL, depression, stress, and self-esteem (Belanger et al, 2011). That study also reported that only about half of YACS met public health PA guidelines and almost a quarter were completely sedentary. In a separate paper, it

was reported that anticipated enjoyment was the strongest correlate of PA in YACS (Belanger et al., 2012b). Consequently, strategies that focus on making PA fun and enjoyable for YACS may have the greatest potential to improve psychosocial outcomes and lead to long term exercise adherence. Arguably, sport participation may be viewed as a fun activity for most young people because of the challenge of competition, the learning of new skills, and the social nature. In fact, when YACS were asked what made PA fun, the most common answers were exercising with other people, socializing, meeting new people, and doing a variety of activities (Belanger et al. 2012b). To date, however, only two studies have examined sport participation in cancer survivors (Keats et al., 1999; McGowan et al., 2012) and no study has focused on YACS.

Being diagnosed with cancer as a young adult and going through intensive medical treatments may influence the type, volume, intensity, and nature of sport participation for this group as well as how they might respond to sport participation. For example, YACS may avoid contact or high intensity sports because of concerns about their physical ability or health. Moreover, they may be more apt to select team sports if they felt socially isolated during their diagnosis and treatments. Finally, given the age of YACS they may select different sports than adolescent cancer survivors (Keats et al., 1999) who would still have a parental influence over their sport participation, or older adults whose sport participation tends to decline with age (Statistics Canada, 2005). In turn, YACS may obtain even larger psychosocial benefits from sport given their diagnosis and treatments.

The primary purpose this study was to examine the prevalence, correlates, and psychosocial and QoL outcomes of sport participation among YACS. Based on limited previous research (Keats et al., 1999; McGowan et al., 2012), it was hypothesized that about one third of YACS would be participating in sport and that participation rates would be higher for younger, male, and higher income YACS. It was also hypothesized that YACS who reported sport participation would also report better psychosocial health and QoL.

METHODS

Participants and Procedures

Ethics approval was received from the Alberta Health Services ethics board and the University of Alberta ethics board. These data are from a cross-sectional study of PA that has been described fully elsewhere (Belanger et al., 2011; Belanger et al., 2012a; Belanger et al., 2012b). Eligibility for the study were: (1) diagnosed with invasive cancer in Alberta between the ages of 20-44 and (2) still between the ages of 20 and 44 and living in Alberta, Canada. There is still debate among researchers of the exact definition of 'young adult' cancer survivor, we chose 20-44 as our age range because of a Canadian Cancer Society report (Theis et al., 2006) on young adult cancer survivors in 2006 using this age range. The 2000 YACS were randomly selected by a computerized program from approximately 5000 YACS who met the eligibility criteria. The survey (Appendix C) was conducted by the Alberta Cancer Registry on behalf of the investigators and followed a modified total design method (Dillman, 2000). In the initial mailed materials, prospective participants received (1) a letter of invitation from the

registry explaining the general purpose of the registry and its role in this particular study, (2) a letter from the investigators explaining the study, and (3) a copy of the survey. A postcard reminder was mailed 3-4 weeks later, and a second survey was mailed 3-4 weeks after that to nonresponders. The modification to the total design method was the elimination of the telephone follow-up of nonresponders because our ethics board deemed it to be too intrusive for this target population.

Measures

Medical and demographic information was collected by self-report and included age, sex, education, annual family income, current employment status, race, current smoking and drinking status, general health, comorbidities, height and weight to calculate body mass index (BMI), time since diagnosis, cancer site, disease stage (advanced versus. early), type of treatments received (no versus. yes), current treatment status (on versus. off treatment), recurrence of cancer (no versus yes), and current disease status (disease-free versus existing disease).

Sport Participation. Prior to any questions being asked about sports participation, sport was defined as 'activities where physical skill influences the outcome of competition such as golf, soccer, bowling, tennis, skiing, etc'. Sport participation was assessed using one closed-item (i.e., have you participated in any sports in the past month) and three open-ended questions [i.e., if yes, what type of sport(s) did you do; how often did you usually play (days per week); and how long did you usually play for (minutes per day)].

Quality of Life. The Medical Outcomes Study 36-Item Short Form (SF-36) survey (Ware et al., 1993, Ware & Kosisnki, 2001) was used to assess QoL.

The SF-36 has eight subscales that can be summed and weighted to provide a physical component summary (PCS) score and a mental component summary (MCS) score. The MCS and PCS are scored using a three step procedure. First, the eight subscales are standardized using the means and standard deviations from the U.S. general population. Second, these scores are aggregated using weights (factor score coefficients) from the 1990 U.S. general population. Third, aggregated PCS and MCS scores are standardized using linear T-score transformations with a mean of 50 and a standard deviation of 10 (Ware et al., 2001). The minimally important difference (MID) for the PCS scale is 2-3 points and for the MCS scale is 3 points. Higher scores indicate better functioning. The validity and reliability of the SF-36 has been established in cancer survivors (Pinar, 2005).

Stress. Stress was assessed by the Perceived Stress Scale (Cohen, Kamarck & Mermelstein, 1986). The PSS is a 14 item questionnaire with a 5 point scale (0= never, 1= almost never, 2= sometimes, 3= fairly often, 4= very often). PSS is not a diagnostic tool but is intended to make comparisons of subjects' perceived stress related to current, objective events. PSS scores are obtained by the sum of the 14 items. A higher score indicates a higher degree and longer duration of perceived stress. It has a Cronbach's α of 0.87 and a test re-test reliability score of 0.86. The correlations between perceived stress and other stress measures ranged from 0.22 to 0.32 in a sample of university teachers (Reis, Hino & Anez, 2010).

***Self-Esteem*.** Self-esteem was assessed by the Rosenberg Self-Esteem Scale (Rosenberg, 1965) Rosenberg Self Esteem Scale is a 10 item questionnaire with a 4 point scale (1= strongly disagree, 2= disagree, 3= agree, 4= strongly agree). Rosenberg Self Esteem Scale is scored by the sum of the 10 items with higher scores indicating higher self-esteem. which has a Cronbach's α and test-retest of 0.88 and a construct validity of 0.46 to 0.71 in a sample of wheelchair basketball players (Robins, Hendin, & Trzesniewki, 2001).

Depression. Depression was measured by the Center for Epidemiologic Studies-Depression (CES-D) scale (Andresen et al., 1994). CES-D is a 10 item questionnaire with a 4 point scale (0= rarely or none of the time <1 day, 1= some of the time 1-2 days, 2= much of the time 3-4 days, 3= most or all of the time 5-7 days). CES-D is scores by the sum of the 10 items with higher scores indicating more depressive symptoms. A score greater than 8 indicates high risk of depression. In an evaluation with a cancer population the CES-D had a Cronbach's α of 0.89 and a test-retest score of 0.57 and the correlations between the CES-D and other depressive assessments were between 0.65 and 0.77 (Hann, 1999).

Physical Activity Guidelines. The percentage of participants meeting the public health PA guidelines by sports participation was calculated based on the 2008 Physical Activity Guidelines for Americans (USDHHS, 2008) which suggest that individuals should obtain either 75 min of vigorous activity per week, 150 min of moderate activity per week, or an equivalent combination that double weights the vigorous minutes. These physical activity guidelines have also been

recommended for cancer survivors by the American College of Sports Medicine (Schmitz et al., 2010) and the American Cancer Society (Rock et al. 2012).

Statistical Analysis

All analyses were conducted using SPSS version 19 (SPSS Inc, Chicago, IL). Sport participation was determined by calculating frequencies and percentage of responses. The percentage of YACS meeting the cancer survivor PA guidelines was calculated (Rock et al., 2012) through sport participation alone using two criteria. The first criterion was ≥150 minutes of moderate intensity sport activity or ≥75 minutes of vigorous intensity sports activity per week (or an equivalent combination). The second criterion was ≥150 minutes of moderate or ≥75 of vigorous of sport activity per week (or an equivalent combination) done over at least three days per week, as implicitly suggested in the guidelines. Each sport was given a metabolic equivalent (MET) value to determine intensity (Ainsworth et al, 2011). Moderate activity was defined as 3.0-5.9 METs and vigorous activity was above 6.0 METS. Chi square test (χ^2) were used to examine the associations between the categorical medical/demographic variables and the yes/no sport participation question. Variables that had a statistically significant univariate association ($p<.05$) with sport participation were examined in a stepwise regression model using a p for entry of <.05 and a p for removal of >.10. Independent t-tests were used to examine the differences in psychosocial and QoL outcomes (stress, depression, self-esteem, PCS, and MCS) based on the yes/no sport participation question. Stepwise regression variable selection technique was used due to the exploratory nature of this study. Analyses of covariance

(ANCOVAs) were also conducted to adjust for age, sex, marital status, education, ethnicity, BMI, months since diagnosis, surgery, chemotherapy, radiation, current treatment status and current cancer status.

RESULTS

Flow of participants through the study has been reported elsewhere (Belanger et al., 2011). Briefly, of the 2000 mailed surveys, 588 surveys were returned completed and 460 were returned because of a wrong address resulting in a 29% completion rate (588/2000) and a 38% response rate (588/1540) excluding the wrong addresses. Demographic and medial date have also been reported elsewhere (Belanger at al., 2011). In brief, the mean age of the participants was 38.2 ±5.6, 70% were female, mean months since diagnosis was 73.6 ± 52.1, 73% were married, and 62% reported completing university/college. The mean BMI was 26.5 ± 5.7 with 53% of the participants being overweight or obese (BMI >25). The most common cancers were breast (23%), thyroid (14%) and lymphoma (12%). At the time of the survey, 87% of participants were disease-free and 51% were meeting PA guidelines. Based on some limited registry data, we found that our sample was similar in age, surgery rate, time since diagnosis, and most cancer sites compared to nonresponders but slightly over-represented women, breast cancer, chemotherapy treatment rate, and radiation therapy treatment rate.

Prevalence of Sport Participation

Overall, 32.5% of YACS reported that they participated in a sport over the last month (Table 1). Golf was the most frequently reported sport (40.8%)

followed by ice hockey/ball hockey (8.3%). YACS participated mostly (64%) in moderate intensity sport with 36% reporting vigorous intensity sports. YACS reporting sport participation in the past month reported an average frequency of 1.7 (SD=1.0) days/week and an average duration of 119 (SD=68) minutes/session for a total weekly minutes of sport participation of 189 (SD=164). Based on the cancer survivor PA guidelines without a frequency restriction, 16.5% of YACS were meeting the equivalence of ≥150 minutes of moderate activity/week. If a frequency of at least 3 days/week is required, 4.3% of YACS achieved the PA guidelines.

Correlates of Sport Participation

In univariate analyses, YACS were more likely to participate in sport if they were male (p<.001), Caucasian (p<.001), wealthier (p=.005), and employed full time (p=.009) (Table 2); and if they were in better health (p p<.001), had no comorbidities (p=.011), were normal weight (p=0.011), had normal blood pressure (p=.026), and normal cholesterol (p=.024) (Table 3). In multivariate regression analysis, 8.5% (p<0.001) of the variance in sport participation was explained by being male (β=.17; p<0.001), Caucasian (β=.15; p=0.001), in better general health (β=.15; p<0.001), and being normal weight (β=-.10; p=0.024).

Associations of Sport Participation with Psychosocial Health and Quality of Life

In terms of psychosocial health outcomes, sport participation over the past month was significantly associated with all three indicators of psychosocial health (Table 4). Specifically, sport participation was associated with lower depression

[mean difference=-1.9 (95% CI= -2.9-0.9); p<.001; Cohen's d=0.39], higher self esteem [mean difference=2.7 (95% CI= 1.8-3.7); p<.001; Cohen's d=0.51], and lower stress [mean difference=-3.0 (95% CI= -4.5-1.5); p<.001; Cohen's d=0.36]. Sports participation was also associated with higher scores on the PCS [mean difference=3.4 (95% CI= 1.9-4.9); p<.001; Cohen's d=0.40] and MCS [mean difference=2.9 (95% CI= 0.8-4.7); p<.001; Cohen's d=0.25]. These differences remained after adjusting for the covariates for all psychosocial and QoL health outcomes except MCS, which became borderline significant (see Table 4).

DISCUSSION

Approximately one third of YACS reported participating in sport, which is comparable to the 31% sport participation rate reported in the general Canadian population of the same age range (Statistics Canada, 2005). Moreover, it is also comparable to the 34% reported in a study of adolescent cancer survivors (Keats et al., 1999). It is slightly higher, however, than the 23% sport participation rate reported for colorectal survivors who were generally older with a mean age of over 65 years (Speed-Andrews et al., 2012). These findings support the trend in the healthy population of sports participation decreasing with age (Statistics Canada, 2005). Although one-third of YACS participated in sport in the past month, only 16.5% were achieving the PA guidelines (USDHHS, 2008) through sport participation alone, and only 4.3% were achieving the guidelines if 3 days/week is required. These data are similar to the data for colorectal cancer survivors (McGowan et al., 2012). Sport seems to be just as popular among YACS as it does with the overall population, but only a small percentage certain

of YACS reported participation profiles that meet national guidelines for PA. For example, over have of YACS in the present study that were involved in sport participated only once per week. Consequently, sport interventions in YACS may need to focus on sports that are played more frequently or promote multiple sport activities to meet the suggested frequency of 3 days/week. The most common sport reported for YACS was golf (40.8%) which is the most common sport played in Canada (Statistics Canada, 2005). The golf participation rate for YACS was lower than the 58.7% reported for colorectal survivors (McGowan et al., 2012). This difference may be due to the older age of colorectal cancer survivors and the tendency for golf participation to increase with age (Statistics Canada, 2005). Moreover, it might also be influenced by the timing of the survey as the colorectal survey was conducted during the months of May to July whereas the YACS survey was conducted during October to December. Although golf has traditionally attracted older adults, over the last few years it has attracted a younger demographic (Cousineau, 2009). Golf may be one example of a sport that could be promoted to YACS because it is considered moderate intensity depending on whether or not players take an electric cart or walk and carry their clubs (Ainsworth et al., 2011). Moreover, golf has been shown to have positive effects on aerobic performance, trunk endurance, body composition and cholesterol (Parkkari, et al., 2000). There are several caveats to consider as golf is a sport that it is often played only once per week, so other activities would also need to be encouraged. Golf is also an expensive sport, requires a large recreational area and an extensive amount of time per game. The popularity of

golf among YACS given the high cost could be due to the high family income and the majority of YACS being employed full time. Golf should be considered an option for PA promotion among YACS.

Golf was followed by ice hockey/ball hockey (8.3%), tennis (7.3%), soccer (5.7%), swimming (5.2%), baseball (4.7%), and bowling (4.7%). This mirrors the most popular sports in the general population in Canada (Statistics Canada, 2005). It is important to note the diverse number of sports played by YACS. Previous research in colorectal cancer survivors (McGowan et al., 2012) indicated golf was followed by bowling as the second most common sport. In YACS, bowling was the 6th most common sport, preceded by much more vigorous sports. All sports reported by YACS were at least in the moderate intensity range (3.0-5.9 METs) and many were in the vigorous intensity range (>6 METs). Consequently, a potential benefit of promoting sports to YACS is that it ensures individuals are working at the intensity suggested by the PA guidelines for optimum health benefits.

In terms of the correlates of sport participation, it was found that gender, ethnicity, general health and body mass index were associated with sports participation. In our sample, men were more likely to play sport than women, which is true for sport participation for Canadians in general (Statistics Canada, 2005) and colorectal cancer survivors (McGowan et al, 2012). In a study examining determinants of PA in YACS there was also a correlation between general health and amount of PA (Belanger et al., 2011). YACS who are in better general health may be more able and more confident to engage in PA and sport.

This association is also true in the general Canadian population (Statistics Canada, 2005). Similarly, in ethnic minorities in the general population participate less in sport (Rowe & Champion, 2000). It is interesting to note that YACS of normal body mass index where more likely to participate in sport. This is notably a complex issue with over half the YACS surveyed being overweight or obese. It would be beneficial to understand the factors affecting weight in this population. Future PA research for YACS may examine the determinants of sport participation separately for females so that interventions can be developed to encourage females to participate in sport. It may also be interesting to address the unique barriers YACS with lower general health, higher BMI or from an ethnic minority have to sports participation. Sports participation declined slightly with age although it was not significant. This may be due to the fact sports participation already has a major decline at age 18, and then plateaus during the young adult age, with further declines with older age (Statistics Canada, 2005). The age ranges reflected in the present study may be too similar to note a significant decline.

In terms of psychosocial health outcomes, sport participation was associated with better scores for depression, stress and self-esteem. It is unclear, however, what the causal direction of this association might be or whether other variables might explain this association. ANVOAs were used to adjust for many of the important medical and demographic variables that may explain these associations, and the results were unchanged except for the mental component of QoL.

A study examining sports participation in adolescent cancer survivors (Keats et al., 1999) found that survivors who maintained their organized sport participation across their cancer experience (from prediagnosis to treatment to survivorship) reported better general self-concept, physical abilities, parental relations, and better relationships. Specifically, sport has been associated with improved self-esteem in young adults and adolescence with physical disabilities (Scarpa, 2011). This is the first study that we are aware of that examines the relationship between sport and psychosocial variables in YACS. Future studies are needed to explore the direction of this relationship.

PA has a well established positive effect on QoL in cancer survivors, especially the physical and functional aspects of QoL (Trinh et al., 2011; Vallance et al., 2005; Stevinson et al., 2007; Peddle et al., 2008; Karvinen et al., 2007; Lowe et al., 2009). PA is also to be associated with QoL in YACS (Belanger et al., 2011). The present study is the only one we are aware of to examine the association between sport and QoL in cancer survivors. In this study, YACS that participated in sport scored 3.4 points higher on the PCS and 2.9 points higher on the MCS. Both the PCS and MCS differences are higher than the 2 point MIDs for these scales. Similar to PA in YACS (Belanger et al., 2011), sport participation had a slightly stronger association with PCS than MCS.

Our study has several strengths and limitations that need to be acknowledged. To the best of our knowledge this is the first study examining sport participation in YACS, and only the third study to examine sport participation in any cancer survivor group. We obtained a large sample size that

was fairly representative of the YAC population of Alberta and used validated measures of psychosocial health and QoL. The limitations to our study include a modest response rate although it is similar to other PA studies using the Alberta cancer registry (Speed-Andrews et al., 2012; Stevenson et al., 2007). Other limitations included the self-report measures of medical information, the over representation of certain groups (e.i. women, breast cancer, chemotherapy treatment rate, and radiation therapy treatment rate), the broad definition of sport that failed to exclude lower intensity sports, a sport measure that has not been tested for reliability and validity, and relatively low scores on the CES-D. YACS who participated could have been more interested in PA and sport participation and better psychosocial health. Despite these limitations, this study provides useful data to assist in the development of future research and possible sport participation interventions in YACS.

In summary, the results of the present study indicate that YACS are participating in sport to the same extent as their healthy peers. In general, YACS indicated they participated in golf and hockey, which may reflect the availability and popularity of these sports in Alberta. Moreover, participation in sports was associated with better psychosocial health and QoL. Our results also identify certain subgroups of YACS who are less active in sport (i.e., women, minorities, obese, and those in poorer health) who may benefit from more targeted interventions.

Sport participation may be an acceptable and desirable strategy to help YACS increase PA and improve psychosocial health. Future studies should

include a more concise definition of sport, a question about the intensity of the sport, and investigate sports participation separately than general PA. Future research could also investigate the barriers to participating in sport for YACS. A qualitative analysis on the experiences of sports participation may give more insights to the benefits and barriers of sports participation to this population and the potential for psychological growth through sport participation. A randomized controlled trial of sports participation in YACS may provide desired information about safety and efficacy of sports participation as a strategy to increase PA and psychosocial health in YACS as well as determine the direction of the relationship between sports participation and psychosocial variables. Studies in the area of sport are highly concentrated on children and youth. More literature is needed to understand how sports can affect health in the adult population and within subgroups of adults. Expanding on this literature could help clinicians make recommendations on sports participation for YACS.

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Table 1. Sport participation in young adult cancer survivors in Alberta, Canada, October-December, 2008.

Sport Variable	M (SD)	***N* (%)**
Sport participation in the last month (*n*= 588)		
No		397 (67.5%)
Yes		191 (32.5%)
Type of sport reported (*n*=191)		
Golf (4.5 METs)		78 (40.8%)
Hockey/ball hockey (8.0 METs)		16 (8.3%)
Tennis (7.0 METs)		14 (7.3%)
Soccer (7.0 METs)		11 (5.7%)
Swimming (7.0 METs)		10 (5.2%)
Baseball (5.0 METs)		9 (4.7%)
Bowling (3.0 METs)		9 (4.7%)
Other (e.g., volleyball, water sports)		44 (23.0%)
Frequency of sports participation per week (*n*=191)	1.7 (1.0)	
1 day		107 (56.0%)
2-4 days		49 (25.7%)
5-7 days		35 (18.3%)
Duration of sports participation per session (*n*=191)	119 (68)	
<75 minutes		55 (28.8%)
75-149 minutes		83 (43.5%)
150-300 minutes		52 (27.2%)
>300 minutes		1 (.005%)
Total minutes of sport participation per week (n=191)	189 (164)	
<75 minutes		41 (21.5%)
75-149 minutes		53 (27.7%)
150-300 minutes		69 (36.1%)
>300 minutes		28 (14.7%)
Meeting guideline of 150 minutes of activity per week (n=588)		
Achieving guidelines		97 (16.5%)
Not achieving guidelines		491 (83.5%)
Meeting guideline of 150 minutes of activity per week over 3 days per week (n=588)		
Achieving guidelines		25 (4.3%)
Not achieving guidelines		563 (95.7%)

METs= metabolic equivalent which is a measurement of human energy. A body at rest uses 1 MET to maintain function. Physical activity is measured in multiples of METs. For example, walking at a 3 miles per hour pace equals 3 METs.

Table 2. Demographic and behavioral correlates of sport participation in young adult cancer survivors in Alberta, Canada, October-December, 2008.

Demographic/Behavioral Variables	No Sport Participation (67.5%)	Sport Participation (32.5%)	P (χ^2)	P (r)
Gender				
Male (n=174)	56.3%	43.7%		
Female (n=414)	72.2%	28.0%	<0.001	
Age				
20-29 (n=52)	61.5%	38.5%		
30-39 (n=236)	67.8%	32.2%		
>40 (n=300)	68.0%	31.7%	0.623	0.451
Ethnic origin				
White (n=514)	65.0%	35.0%		
Other (n=74)	86.5%	15.0%	<0.001	
Marital status				
Married (n=428)	68.2%	31.8%		
Not Married (n=160)	65.6%	34.0%	0.550	
Education				
≤ some college (n=224)	67.9%	32.1%		
Completed college (n=364)	67.3%	32.2%	0.890	
Family Income				
<80,000 (n=314)	72.8%	27.2%		
≥80,000 (n=214)	61.4%	38.6%	0.005	
Employment status				
Not employed/part time (n=239)	73.6%	26.4%		
Employed full-time (n=349)	63.3%	36.7%	0.009	
Smoking				
Never (n=371)	65.5%	34.5%		
Ex smoker (n=143)	69.2%	30.8%		
Smoker (n=74)	74.2%	25.7%	0.295	0.120
Alcohol consumption				
Never drink (n=153)	72.5%	27.5%		
Social/Regular (n=435)	65.7%	34.3%	0.123	

Note: P(χ^2) = Chi square, and P (r) = Pearson Product Moment Correlation.

Table 3. Medical correlates of sport participation in young adult cancer survivors in Alberta, Canada, October-December 2008.

Medical Variables	No Sport Participation (67.5%)	Sport Participation (32.5%)	P (χ^2)	P (r)
Cancer site				
Breast (n=137)	73.0%	27.0%		
Thyroid (n=80)	73.8%	26.3%		
Lymphoma (n=72)	68.1%	31.9%		
Cervix (n=44)	61.4%	38.6%		
Testes (n=37)	54.0%	45.9%		
Melanoma (n=33)	51.5%	48.5%		
Brain (n=31)	61.3%	38.7%		
Colorectal (n=27)	66.7%	33.3%		
Leukemia (n=26)	61.5%	38.5%		
Other (n=101)	71.3%	28.7%	0.181	N/A
Radiation therapy				
Yes (n=307)	69.7%	30.3%		
No (n=281)	65.1%	34.9%	0.237	
Surgery				
Yes (n=494)	66.6%	33.4%		
No (n=94)	72.3%	27.7%	0.277	
Chemotherapy				
Yes (n=314)	67.2%	32.8%		
No (n=274)	67.9%	32.1%	0.860	
Current disease status				
Disease free (n=514)	66.9%	33.1%		
Existing disease (n=74)	71.6%	28.4%	0.421	
Time since diagnosis				
< 24 months (n=151)	72.8%	27.2%		
24-59 months (n=225)	67.1%	32.9%		
≥60 months (n=212)	64.2%	35.8%	0.216	0.086
General Health				
Poor-Fair (n=272)	77.9%	22.1%		
Good (n=203)	74.8%	25.0%		
Very good-Excellent (n=113)	57.7%	42.3%	<0.001	<0.001
Body mass index (kg/m^2)				
< 25 (n=278)	63.3%	36.7%		
25 to 29.9 (n=187)	67.9%	32.1%		
≥30 (n=123)	76.4%	23.6%	0.035	0.011
Comorbidity Status				
No co-morbidities (n=415)	64.3%	35.7%		
1 co-morbidity (n=127)	74.0%	26.0%		
>1 co-morbidities (n=46)	78.3%	21.7%	0.034	0.011
High Blood Pressure				

Normal Blood Pressure (n=502)	65.7%	34.3%	
High Blood Pressure (n=86)	77.9%	22.1%	0.026
Cholesterol			
Normal cholesterol (n=516)	66.0%	34.1%	
High cholesterol (n=72)	79.2%	20.8%	0.024
Arthritis			
Yes (n=526)	67.1%	32.9%	
No (n=62)	71.0%	29.0%	0.540

Note: $P(\chi^2)$ = Chi square, and P (r) = Pearson Product Moment Correlation.

Table 4. Associations between sports participation and psychosocial health and quality of life in young adult cancer survivors in Alberta, Canada, October-December, 2008.

	No Sport Participation (67.5%)	**Sport Participation (32.5%)**	**Between group difference**	**Cohen's *d***	**p value for ANOVA/ ANCOVA**
Self-Esteem[a]	31.7 (5.8)	34.4(4.8)	2.7(1.8-3.7)	0.51	<0.001
Self-Esteem[b]	31.8(0.3)	34.1(0.4)			<0.001
Depression[a]	7.6(5.7)	5.7(5.2)	-1.9(-2.9-0.9)	0.39	<0.001
Depression[b]	7.4(0.3)	5.9 (0.4)			<0.002
Stress[a]	22.9(9.1)	19.8(8.1)	-3.0(-4.5-1.5)	0.36	<0.001
Stress[b]	22.7(0.4)	20.1(0.6)			0.001
Physical Component Summary[a]	49.3(9.6)	52.7(6.9)	3.4(1.9-4.9)	0.40	<0.001
Physical Component Summary[b]	49.5(0.4)	52.2 (0.6)			0.001
Mental Component Summary[a]	45.0(12.2)	47.9(11.0)	2.9(0.8-4.9)	0.25	0.006
Mental Component Summary[b]	45.3 (0.6)	47.1 (0.9)			0.085

Note: Cohen's *d* is calculated as the between group difference divided by the pooled standard deviation.

[a] Unadjusted mean (standard deviation)

[b] Mean (standard error) adjusted for age, sex, marital status, education, ethnicity, BMI, months since diagnosis, surgery, chemotherapy, radiation, treatment status, smoking, drinking and number of comorbidities.

Chapter 5

Development and preliminary evaluation of a targeted physical activity guidebook for young adult cancer survivors

Over 80% of young adult cancer survivors (YACS) survive their diagnosis, resulting in a growing cohort of long-term survivors of young adult cancers [1]. Unfortunately, surviving cancer means enduring extensive medical treatment (e.g., surgery, chemotherapy, radiation therapy, hormone therapy) that can influence their quality of life (QoL) [2, 3]. Being diagnosed with cancer as a young adult presents the possibility for many years of survivorship [1].

One intervention that has been found to improve QoL in cancer survivors is physical activity (PA) [4]. PA has also been shown to improve physical fitness, reduce fatigue and increase physical functioning in colon [5], breast [6,7], lymphoma [8] and other cancer survivor groups [9-11]. Previous literature has indicated that PA may enhance QoL and self-esteem, and decrease stress and depression in YACS, however only approximately half of YACS are meeting the public health guidelines for PA [4]. Moreover, over 80% of YACS are interested in receiving PA information [12] yet there are no interventions or resources developed to improve PA rates in YACS. Given these findings, there is a need to develop and evaluate methods of promoting PA in YACS.

Written health information is one method that holds promise in promoting PA. In other populations, written PA information for promoting PA have demonstrated positive results [13-16], and written material was specifically indicated as a preference for PA information delivery in YACS [12]. A survey of 954 Canadian PA professionals demonstrated that print resources were identified

as a primary way to communicate PA information [17]. Other advantages of written health materials are self paced learning, consistency of message, [18] and ease of delivery in places such as doctor offices, and pharmacies. It is important that written health information is evaluated for appropriateness to behavior and suitability for the intended population prior to distribution to improve the likelihood of successful behavior change [19].

Researchers have also indicated that written health information should be theory based and take into account the unique preferences of the targeted population in order to effectively facilitate behavior change [20]. Using a behavioral theory based approach allows researchers to explore the mechanisms behind behavior change [19]. The recent updates to the public health PA guidelines in both Canada [21] and the United States [22] have included motivational information using a collection of theoretical constructs from different theories. Studies in many populations have indicated that the theory of planned behavior (TPB) [23] may have utility for developing behavior change interventions [24-26]. The TPB is a commonly used and validated model for exploring PA motivation and behavior in cancer survivors [16, 27-31]. These studies have demonstrated promising evidence that the TPB may be useful model for understanding PA in cancer survivors.

The TPB may be particularly relevant framework in cancer survivors because it includes personal (attitude), normative (subjective norms), and control (perceived behavioral control) factors that may be influenced by treatment related side effects and co-morbidities [32]. The TPB postulates that intention

(motivation) is the immediate determinant of behavior. Intention is determined by subjective norm (perceived social pressure to perform behavior), attitude (positive or negative evaluation of behavior), and perceived behavioral control (PBC; confidence and control over performing behavior). Moreover, subjective norm is based on normative beliefs (specific individuals that may approve or disapprove of behaviors), attitude is based upon behavioral beliefs (specific perceived advantages and disadvantages of participating in the behavior), and PBC is based on control beliefs (specific barriers and opportunities the individual has for performing the behavior) [32].

More recently, Ajzen hypothesized that the TPB constructs are higher order structures with two lower order components; attitude (affective/instrumental, i.e. enjoyment/benefit), subjective norm (injunctive/descriptive) and perceived behavioral control (perceived control/self efficacy) [33]. The two-component model is considered to be superior to the traditional model to explaining exercise behavior in the general population. Recent applications of the TPB in other cancer survivor groups have indicated the superiority of the two-component mode [34-37]. In addition, planning (detailed plan on how to accomplish the behavior) has been proposed as a critical variable for translating intentions into behavior [38].

In a recent study examining the determinants of PA in YACS, we found that the TPB explained 38% of the variance in PA with significant contributions from intention, planning, and affective attitude [39]. In turn, 56% of the variance in intention was explained by perceived behavioral control, instrumental attitude,

and affective attitude. Therefore, the TPB appears to be a potential useful model for developing PA interventions in YACS and should emphasize developing strong intentions by targeting perceived behavioral control, instrumental attitude, and affective attitude.

The TPB has already been used in the development of two PA guidebooks for cancer survivors. The first guidebook was for breast cancer survivors called *Exercise for Health*[19]. The information in the PA guidebook was formulated and written based on preferences, as well as the behavioral, normative and control beliefs collected from previous studies on breast cancer survivors. After the guidebook's initial development it was evaluated by TPB experts, exercise oncology fitness experts, oncologists, and health information specialists for its appropriateness and fidelity to the TPB. After completion of the preliminary evaluation the guidebook was tested for effectiveness in a randomized control trial. The *Exercise for Health* guidebook demonstrated to be effective in increasing PA and motivation in the **Act**ivity Promot**ion** (ACTION) trial involving 377 breast cancer survivors [16].

A second guidebook was developed for colon cancer survivors called *Step Up to the Challenge* [40]. This guidebook was evaluated in a very similar way with the addition of more experts including rehabilitation specialists. This guidebook is currently being incorporated into a randomized controlled trial (CHALLENGE trial) with colon cancer survivors in Canada and Australia [41].

Research into exercise preferences of YACS indicated that the majority of YACS were interested (78%) and able (88%) to participate in a PA program

designed for YACS. YACS also preferred receiving information by brochure/print materials (64%), starting PA after treatment (64%), walking (51%), doing PA with others (49%), and doing PA at a community fitness center (46%) [12]. To date, however, no PA guidebook has been developed for YACS. The purpose of this study was to develop and evaluate a TPB-based PA guidebook designed specifically for YACS.

Methods

Development of the Guidebook

A guidebook was developed for YACS based on the theoretical components of the TPB [23, 39] and previous similar guidebooks developed for breast cancer survivors and colon cancer survivors [19, 40]. The guidebook was a 8" x 6.5" coiled book with approximately 70-80 pages. The guidebook was titled *Stride to Survive*. The guidebook included participant centered activities designed to enhance attitude (i.e., instrumental and affective attitudes), subjective norm (i.e., injunctive and descriptive norms), perceived behavioral control (i.e. self-efficacy and controllability), planning and intention (e.g., goal setting). These activities are also designed to facilitate participant engagement in the information as well as control over the behavior such as including a worksheet and PA tracking sheet.

The guidebook addressed all the key components of TPB but emphasized the constructs that demonstrated the strongest association with PA in previous literature [39]. The guidebook was also based on information collected in a provincial survey examining the exercise preferences among YACS [12].

Therefore, the guidebook was targeted for YACS post treatment, included information on a variety of PA types, how to include others in a PA program, and options for PA at community fitness centers.

The first section of the guidebook, chapter 1, included an introduction to the guidebook. Chapter 2, entitled 'Why Should I Exercise' addressed instrumental attitudes and included the behavioral beliefs of (a) feeling good about yourself, (b) stress relief, (c) increased energy, (d) getting back to the things you value, (e) improved immune system, (f) reduced risk of chronic disease and (g) reduced risks of some cancers. Figures and graphs were used to visually represent the evidence-based benefits of PA. Quotes were included from an oncologist specializing in cancer affecting adolescents and young adults and an exercise physiologist that works with cancer survivors to address injunctive norms.

Chapter 3 entitled 'What Types of Exercise Should I Do, and How Much?' addressed PBC and included knowledge related to (a) cardiovascular training, (b) FITT Principle (frequency, intensity, time and type), (c) resistance training, and (d) exercise principles.

Chapter 4 entitled 'Exercise Safety and Precautions' also addresses PBC, which included topics such as (a) stop exercising if you experience, and (b) what to wear during exercise?.

Chapter 5 entitled 'Moving Forward' is aimed at formulating a strong intention to be active. This section prompts the reader to set "SMART" goals for PA which are **S**pecific, **M**easurable, **A**chievable, **R**ealistic and **T**imely.

Behavioral and performance goals are explained. Examples are given for both behavioral and performance goals are given and space for the participant to write down their goals.

Chapter 6 is titled 'Planning' and addresses planning PA. This chapter describes how to plan for the what, when, where, and how for PA. It offers three examples for each and spaces for participants to write their own plan for each one of the variables. The planning component was adapted from McGowen et al. [42] as planning demonstrated an increase in behavior change in prostate cancer survivors.

Chapter 7 titled 'Overcoming Barriers' address the most common barriers YACS have stated and strategies to overcome them. This chapter targets the most common control beliefs identified by YACS including (a) lack of time, (b) side effects of chemotherapy, (c) bad weather, and a section to write down three of the participant's personal barriers and how to overcome them.

Chapter 8 titled 'Making Exercise Fun' targets the affective beliefs underlying affective attitude and offers strategies to increase the enjoyment when engaging in PA. Strategies include (a) exercising with a friend, (b) listening to music, (c) variety of exercise and a space for participant to write what variety of exercise they can include in their PA routine.

Chapter 9 is a brief chapter titled 'Getting Social Support for Exercise' which targets the normative beliefs identified by YACS as most important to their PA behaviors. This chapter discusses how to get important people in YACS life involved in their PA program such as friends, family and coworkers. Chapter 10

titled 'Building A Supportive Environment' which addresses both injunctive and descriptive norms. This chapter discusses what is available in your community/surroundings for exercise (e.g. walking trails, gyms) and in your home. The end of the chapter discusses how YACS can reward themselves if they accomplish their goals.

The second last chapter titled 'What If I Stop Exercising for A While' addresses PBC. It discusses strategies to get back to PA incase motivation is low or YACS stop exercising for a period of time.

The last chapter titled 'Exercise Program' offers an example of an exercise program and addresses the planning component of TPB. Throughout the guidebook there are be quotes and pictures from YACS addressing what PA has meant to them during their cancer treatment and for survivorship. These quotes are to address descriptive norms.

There is a removable sheet with a blank exercise program and goal setting for readers to fill in. This removable page is for YACS to take the page out of the guidebook and put it somewhere visible. This sheet is to amplify the intention and planning component of the TPB.

Preliminary Evaluation of the Guidebook

After the development of the guidebook, 52 expert judges were approached to evaluate it for its accuracy, content, and readability. Judges who were approached consisted of (a) young adult cancer survivors (n=22) (b) medical oncologists (n=5) (c) exercise physiologists (n=10), (d) health information specialists (n=5) and (e) TPB experts (n=10). Groups (a), (b), and (c) were

selected due to their experience with the population for whom the information is intended. Groups (d) and (e) were selected due to their expertise in writing health information and psychological theory. All TPB judges had a doctoral degree in exercise psychology or related field and had a track record of publishing research in either TPB or other social cognitive theories. YACS were recruited through an advertisement on Young Adult Cancer Canada's website and social media. If interested, YACS were asked to email the investigators and they would respond with a copy of the guidebook and assessment. Medical oncologists were selected due to their subspecialties involving many YACS. Exercise physiologists were selected based on their clinical experience with adult cancer patients. Health information specialists were from the faculty of Information Science, specializing in health information knowledge translation. Health information specialists were graduate students from the Information Sciences department at the University of Alberta. All judges were either contacted in person or by e-mail to determine their interest in participating in the assessment procedure. All experts that expressed interest in participation were sent, either by post or hand delivered the PA guidebook and relevant questions to their expertise (Appendices D-H). The TPB experts were sent a TPB evaluation form.

Measures

Readability. Readability was assessed by using the computer-based Flesch-Kincaid reading grade level statistics.

Maine Area Health Education Center Assessment Checklist (Maine AHEC), The Main AHEC 18-item checklist was used to assess the suitability and

appropriateness of written health materials [43]. Expert judges were asked to check off each of the attributes found on the checklist as they read through the guidebook content. A missing check indicated a deficiency in the suitability or appropriateness. The AHEC checklist evaluates the suitability and appropriateness of health education materials in four categories (a) organization (e.g., "The cover page is attractive. It indicates the core content and intended audience"), (b) writing style (e.g., "There is little or no technical jargon"), (c) appearance (e.g., "Illustrations serve to amplify the text"), and (d) appeal (e.g., "Interaction is invited via questions, responses, suggested action, and so on."). One extra item was added to the writing-style domain that was designed to assess the reading ease based on the expert judges' perceptions (i.e., "The reading level is appropriate"). YACS and medical oncologists were asked to complete three extra items designed to assess the feasibility, safety, and accuracy of the PA guidebook. (e.g., "Medical information is accurate"; "Guidebook is appropriate for YACS that have completed treatment").

TPB Content Assessment. TPB experts numerically rated the degree of match between the PA guidebook information and specified TPB components (i.e., attitude, subjective norm, perceived behavioural control, and implementation intentions) on a 5-point Likert scale (0=poor match, 4=excellent match). TPB experts also completed one item designed to assess how well they perceived that the PA guidebook was an overall representation (0=poor representation, 4=excellent representation).

Written Feedback. All expert judges were given space to provide written qualitative feedback. Qualitative feedback is an important part of the development process given that the use of mixed-method approaches enhance the breadth of feedback and overall quality of the guidebook information.

Analysis

All numerical data were evaluated using SPSS Version 19. Two separate Flesch-Kincaid Reading Level analyses were conducted. The first analysis was done on the exact text of the guidebook. In the second analysis, the word 'exercise' was coded with the word 'work' and the words 'peripheral neuropathy' was coded with the words 'nerve damage'. This was done because the word 'exercise' is a polysyllabic word that may inflate inaccurately the reading grade level, even if this term is well understood by most. To ensure the term is understood by the reader, exercise is defined in the guidebook. Peripheral neuropathy was changed because it is also a polysyllabic word, it can be assumed that if participants have peripheral neuropathy they are inclined to know what it and if not, it is clearly defined. The inclusion may also inaccurately increase the reading level..

To score the AHEC checklist, the average agreement percentages were calculated for each judge on each of the categories. The mean score for each category across the expert judges was then calculated. A preliminary evaluation of the expert judges was done to identify discrepant judges prior to analyzing the TPB data. Discrepant judge's evaluations were determined by computing the difference of each judge's rating from the median rating (JDM: judge discrepancy

from the median). Values close to zero are considered ideal as they show agreement among the judges. The item uncertainty was determined by calculating the range (R: highest minus lowest rating plus 1) of the ratings indicated by the group of expert judges. R-values closer to 1 are ideal and suggest that there is minimal uncertainty in the judge's ratings from the item being evaluated. After the descriptive statistics were calculated, Aiken's item content validity coefficients (Aiken's V) was calculated [44] Aiken's V provides a statistical test for relevancy and provides a method of testing the extent to which the judges feel each item measures the intended category. An Aiken's V-coefficients value approaching 1.0 would indicate there is minimal uncertainty in the expert ratings across the categories being evaluated. A value of 1.0 indicates that all *n* judges give an item the highest possible score. The statistical significance of each V-coefficient were then determined by comparing the values against a right-tailed binomial probability table described by Aiken [44]. Descriptive statistics of the TPB expert ratings were calculated to determine the mean-item content relevance ratings. Following statistical evaluation, each expert judge's written feedback were analyzed to determine if any alterations to the guidebook should be done.

Results

Participants Characteristics

Sixteen YACS responded to the guidebook evaluation questionnaire. YACS represented a diverse number of cancers including colorectal (n=1), leukemia (n=3), testicular (n=2), lymphoma (n=4), sinus (n=1), ovarian (n=1), lung (n=1), thyroid (n=1), sarcoma (n=1), and breast cancer (n=1). YACS were a

mean age of 30.6 years (SD=5.5), an average of 33.4 months (SD=5.5) post treatment, 56% of YACS had never been married, 56% of YACS were employed full time, 76.2% were female and 50% completed a university degree.

Nine TPB experts, four exercise physiologists, five health information specialists and one oncologist responded to the survey.

Readability Evaluation

In the first analysis (i.e., with *exercise*) a 9.0 Flesch-Kincaid reading level was obtained. In the second analysis, (i.e. *exercise* replaced with *work* and *peripheral neuropathy* was replaced with *nerve damage*) a 8.4 Flesch-Kincaid reading level was obtained.

Assessment Checklist

YACS and health information experts scored the guidebook high for organization, writing style, appearance, and appeal. Average scores ranging from 76.7% to 91.7% in agreement with each category (Table 1). YACS, exercise physiologists and the medical oncologist strongly support the medical and exercise content in the guidebook. The one exception is the medical oncologist rates the exercise recommendations as not being suitable for YACS. This was followed by the written statement that the information was too complex and needed to be simplified.

TPB Assessment

Table 2 contains the mean item-content relevance ratings as well as the corresponding Aiken's V coefficient for each TPB variable. For the TPB assessment, all seven item-content relevance ratings had the value of 3.9 or

greater indicating a good/very good match between the guidebook content and the key TPB domains. Across the nine TPB judges, JDM scored ranged from 0 to 4. All judges were retained in the analysis. Aiken's item content validity coefficients (V) for each TPB component and the overall component were all significant at the .01 level.

Written Feedback

Expert judges were invited to provide written feedback about the guidebook. Written feedback was received from 93% of YACS, 90% of exercise physiologists, 100% of oncologists, 100% health information experts and 78% of TPB experts. Most comments were focused on minor issues with the appearance of the guidebook that required small changes to enhance the appropriateness of the guidebook. One expert judge from each expert category is presented to demonstrate the value of having perspectives from different fields (Table 3). Revisions were made to the guidebook based on the expert feedback to increase the suitability and appropriateness of the guidebook. Examples are provided in Table 3.

Discussion

The objective of this study was to develop and evaluate a PA guidebook designed specifically for YACS. It is thought that the more appropriate and suitable the behavior change material is for the target population, the more effective it will be to change the behavior [20]. In the attempt to base the guidebook on the TPB, previous research and take into account expert suggestions

that the targeted guidebook would produce more targeted and suitable print material.

The process to develop this guidebook was based on two other studies developing similar guidebook for colon [40] and breast cancer survivors[19]. These guidebooks and respective papers offered the framework for developing the YACS guidebook in the present study. The current study had many of the same categories of judges as previous studies including cancer survivors, oncologists, exercise oncology experts and TPB experts with the addition of health informatics experts. The previously developed breast cancer guidebook [19] did include a couple health information specialists but the most recent colon cancer guidebook [40] did not. Where the other group of experts helped with content and general appearance, health informatics experts gave direction on how the information should be presented. Having health informatics experts involved is a strength of this study, as written health information is not only about the content presented but how the content is presented to the reader.

TPB experts indicated that the content of *Stride to Survive* guidebook matched the theoretical constructs of the TPB. In particular all 6 mean item-content relevance ratings had values of 3.9 or above indicating a good/very good match between the content of the YACS guidebook and the TPB constructs. The Aiken's *V* coefficients indicated that the judges determined that the theoretical content in the guidebook matched each of the TPB constructs. Most print PA material are successful at providing guidelines and general knowledge but are not based on theory or effective techniques to promote PA [20]. There are very few

[19, 40] groups that have evaluated the theoretical underpinnings of their patient material. It is strongly encouraged that interventions are grounded in theoretical frameworks [45], including the written material involved in behavior change trials. We will also be able to better determine the mechanisms for why behavior changed or did not change. The link between theory based written material with theory based content and behavior is unclear, however a recent study indicated that internet interventions that incorporated more theory based content demonstrated a greater effect size and substantial effects on behavior compared to interventions lacking theoretical content [46].

There was a high percentage of support from YACS and health information experts in organization, writing style, appearance and appeal of the guidebook. YACS, exercise physiologists, and the medical oncologist also rated the guidebook high for suitability and appropriateness of exercise and medical information contained in the guidebook. The one exception is the medical oncologist rating the exercise information as not suitable. There was an explanation that followed indicating that they felt the exercise information too complex. It is important to note that all judges scores were prior to any changes made to the guidebook from their feedback. Most changes suggested by the expert panel where made, which would indicate that the final product of the guidebook would score much higher in all categories.

There were several strengths and limitations to this study. Strengths include the extensive development and evaluation of the PA guidebook and the diverse set of experts on the evaluation panel. Limitations include not having a

multi-disciplinary team from the beginning of the development of the guidebook similar to the Canadian Physical Activity Guidelines [21]. Another limitation was that only one out of five oncologists approached responded to the survey. Although the guidebook was grounded in theory and based on a previous survey of YACS, the guidebook may have been enhanced by a focus group of YACS that explored in detail what information YACS and PA.

Theory based guidebooks offer clinicians a practical way to deliver information about health behaviors specific to a particular disease population. Guidebooks could be handed to patients at the end of a clinic visit as an introduction to a desired behavior change, although, further follow up and support may be necessary. The next step in evaluating this guidebook is to explore the likelihood of behavior change in YACS during the randomized controlled trial of the targeted guidebook and the Canadian Physical Activity Guidelines.

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Table 1. Young Adult Cancer Survivors, Health Information Experts, Exercise Physiologists and Medical Oncologists
Responses to PA Guidebook Evaluation Questionnaire

Category/Statement	Percent agreement			
	Young Adult Cancer Survivors (n=16)	Health Information Experts (n=5)	Exercise Physiologists (n=5)	Medical Oncologist (n=1)
Organization	85.7	88.6		
Writing Style	90.3	80.0		
Appearance	91.7	76.7		
Appeal	91.2	86.7		
Guidebook will help young adult cancer survivors improve their exercise behavior	93.8		100.0	100.0
Guidebook is appropriate for individuals that have completed treatment(s) for cancers affecting young adults	81.3		100.0	100.0
Exercise recommendations/prescription throughout the guidebook are suitable for young adult cancer survivors			100.0	0.0
Exercise principles are well described in the guidebook			80.0	
The safety and precautions are adequately described in the guidebook			80.0	100.0
The example exercise programs described at the back of the book are appropriate for			100.0	

young adult cancer survivors				
Medical information is accurate				100.0

Table 2. Theory of Planned Behavior Expert Judge Content Assessment

Theory of Planned Behavior variables	Mean item-content relevance (1-5)	Aiken's *V* (0-1)	*P*	Median	Range
Affective Attitude	4.4	0.85	<0.001	5	3
Instrumental Attitude	4.7	0.93	<0.001	5	1
Subjective Norm	3.9	0.73	<0.001	4	2
Perceived Behavioral Control	4.4	0.85	<0.001	4	1
Intentions	4.3	0.83	<0.001	5	2
Planning	4.8	0.95	<0.001	4	1
Overall	3.9	0.73	<0.001	4	2

Table 3. Samples of Written Feedback From Expert Judges

Expert Reviewer	Comment	Action

Category		
Young Adult Cancer Survivors	I think a tear out sheet or card would be a great addition to this.	A tear out page was added as the end page to the guidebook. This page has a goal setting and detailed planning exercise. There are instructions to fill out the tear away sheet and place it in a visible location.
Medical Oncologist	The guidebook is too long and complex.	Language was simplified from a grade 11 to a grade 8.4 reading level. We also simplified graphs, and pictures were added to compliment the content. The length remained similar but sufficient white space was maintained so the guidebook remained readable and not overwhelming with content.
Exercise Physiologists	The language and format needs to be made more reader friendly.	Language simplified. The format was changed to include substantial white space, more pictures, quotes and examples to make the guidebook more reader friendly.
Health Information Specialists	Parts of the book had sufficient highlights but the lack of colour (the book is all gray) decreases visibility	The interior of the guidebook was printed in colour which created more contrast between headings and different sections.

Theory of Planned Behavior Experts	Subjective Norm: The guidebook should include the idea of exercising with other young adult cancer survivors. Resources for local/provincial/national involvement would be great to include	YACS resources were added to the back of the guidebook. Quotes and pictures of YACS who engage in regular PA were also added to the guidebook.

Chapter 6

Effects of Targeted Print Materials on Physical Activity and Quality of Life in Young Adult Cancer Survivors: A Randomized Controlled Trial

Physical activity (PA) improves quality of life (QoL) and psychosocial outcomes in young adult cancer survivors (YACS) yet only about half are achieving the recommended PA guidelines of 150 minutes of moderate activity per week [1, 2]. In a population based survey, the majority of YACS were able and willing to participate in a PA program [1]. In another survey [3], YACS expressed a high desire for more information and assistance in regards to various support services including PA, yet there are currently no resources available to address PA in YACS.

Print material is one method to promote PA. In other populations, print material has increased PA [4-10] and it was specifically indicated as a preference for PA information delivery in YACS [11]. It is important that print material is evaluated for appropriateness and suitability for the intended population prior to distribution to improve the likelihood of successful behavior change [12]. We have previously developed print material in the form of a PA guidebook targeted to YACS [13] based on similar guidebooks developed for breast [12] and colon cancer survivors [14]. The guidebook was evaluated by expert judges and deemed to be a potentially effective PA print material for YACS. Here, we report a randomized controlled trial to determine the effects of the PA guidebook on PA and QoL. We hypothesized that YACS receiving the targeted PA guidebook (TPAG) would report a greater increase in self-reported PA and QoL than YACS receiving the generic Canadian PA Guidelines (CPAG).

Methods

Participants and Procedures

Research ethics approval was attained from the University of Alberta and the Alberta Cancer Research Ethics Board. The eligibility criteria included (a) diagnosed with any invasive cancer between the ages of 18-39 and still within that age range, (b) within 5 years of cancer diagnosis, (c) free from chronic medical and orthopedic conditions that would preclude PA, (d) able to read and understand English and (e) interested in increasing PA by 60 moderate minutes or 30 vigorous minutes/week.

Design and Recruitment

The Alberta Cancer Registry was used to identify YACS residing in Alberta, Canada and diagnosed within the last 5 years. YACS were mailed an invitation letter to participate in the study and were asked to contact the research group if interested in participation. Interested participants were emailed a link to the on-line baseline survey (Appendix I). Completion of the baseline survey resulted in randomization.

Random Assignment to Groups

Following receipt of a completed baseline questionnaire, YACS were randomized in a 1:1 ratio using a computer-generated random numbers list (GraphPad Software, San Diego, CA) to either: (1) CPAG or (2) TPAG. Participants were mailed the print materials with a page of instructions asking them to read through the print material in detail, read through the whole print material or relevant sections of the guidebook as frequently as possible, and to

place it where it is visible. They received one month (Appendix J) and three month follow up surveys (Appendices K or L).

Interventions

The CPAG group received the Canadian PA Guidelines which is a one page (8"x11") handout developed for healthy adults 18-64 years of age. The guidelines recommend that adults obtain at least 150 minutes of moderate to vigorous aerobic PA a week, and more PA has even greater health benefits. The guidelines address in brief how to measure intensity of PA, possible health benefits of PA, and how to create time for PA. The guidelines were developed based on several reviews of the health benefits of PA in adults [15].

Participants in the TPAG group received the guidebook called "Strive to Survive" which was previously developed and evaluated by expert judges for suitability and content for YACS [13]. The guidebook is based on the theoretical components of the TPB and previous similar guidebooks [12,14]. The guidebook is a 8" x 6.5" bound book with 58 pages. The guidebook has 11 chapters and a tear out planning sheet. The information for the guidebook was formulated based on PA preferences of YACS elicited from a previous study[16]. The guidebook included participant centered activities, which were designed to facilitate participant engagement in the information as well as control over the behavior including an environmental scan, time management worksheet, and PA tracking sheet.

Measures

YACS in both groups were asked to complete surveys at baseline, one month and three months post randomization. Surveys were completed online using Survey Monkey. At one and three months post baseline survey, YACS were prompted by an email to complete the follow up surveys. In the email, there was a direct link to the survey.

Demographic and medical characteristics were collected by self-report and included age, sex, marital status, education, family income, employment status, height, weight, comorbidities, ethnicity, body mass index (BMI, to be calculated by height and weight), cancer type, months since diagnosis, stage of cancer, treatments (chemotherapy, surgery radiation), treatment status, and disease status.

Physical Activity was assessed by the Leisure Score Index (LSI) from the Godin Leisure Time Exercise Questionnaire (GLTEQ) [17]. The LSI assesses the average weekly frequency and duration over the past month of the three levels of intensity of PA: light, moderate, and vigorous. The LSI has established reliability and concurrent validity based on various criteria[18]. PA minutes/week was calculated for moderate and vigorous PA minutes. For total PA minutes (the combination of moderate and vigorous PA minutes) vigorous minutes were double weighted, as suggested in the US Department of Health and Human Services recommendations for PA [19].

Health-related QoL was assessed by the Medical Outcomes Study 36-Item Short Form (SF-36), which is a well validated measure designed to assess perceived functioning and health [20]. It measures eight components that are

weighted and summed to give a physical component composite score (PCS) and mental component score (MCS). Higher scores indicate better functioning. The SF-36 is a well validated QoL measure that has been frequently used in cancer survivors[21] revealing a Cronbach's α coefficient for all the subscales ranging from 0.79 to 0.90, test-retest scores from 0.81 to 0.93 and validity coefficients of ≥0.61.

Perceived stress was assessed by the Perceived Stress Scale (PSS) [22]. It is a measure of the degree to which situations in the participant's life are self-evaluated as stressful. Moreover, the questions are of a general nature and hence are relatively free of content specific to any sub-population group. The PSS is a 14 item questionnaire with a 5 point scale (Ranging from 0= never, to 4= very often). PSS scores are obtained by the sum of the 14 items. A higher score indicates a higher degree and longer duration of perceived stress. The PSS has established validity and reliability (r= 0.85).

Self-esteem was assessed by the Rosenberg Self-Esteem Scale (RSES) which is a brief unidementional measure of global self-esteem[23]. RSES is a widely used and validated measure of self-esteem in the psychosocial oncology literature[24]. RSES is a 10 item questionnaire with a 4 point scale (Ranging from 1= strongly disagree, to 4= strongly agree). RSES is scored by the sum of the 10 items with higher scores indicating higher self-esteem. RSES has a Cronbach's α and test-retest of 0.88 and a construct validity of 0.46 to 0.71 [25].

Depression was assessed by the Center for Epidemiologic Studies-Depression

(CES-D) scale which is a well-validated scale measuring the frequency of depressive symptoms over the past week[26]. CES-D is a 10 item questionnaire with a 4 point scale (ranging from 0= rarely or none of the time <1 day, to 3= most or all of the time 5-7 days). CES-D is scores by the sum of the 10 items with higher scores indicating more depressive symptoms. This questionnaire has also been validated specifically on young adults[27]. Reliability has been established for a chronic disease population (r=.84).

Intervention adherence was measured by asking survivors 'did you read through the PA information sent to you' and 'How often did you read the written PA material over the past month'. *Intervention evaluation* was assessed by asking participants if they found the written PA material easy to understand, informative, and whether written PA material was effective in helping them increase PA. The responses for these questions were on a 7 point Likert scale.

Analysis

Analysis was performed using SPSS version 19 (Chicago, IL). We conducted analyses of covariance (ANCOVA) comparing the groups in total PA minutes, vigorous PA minutes, moderate PA minutes, QoL, stress, self-esteem, and depression. The analyses were adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. To detect a small-to-medium standardized effect size (d= 0.33) on our outcomes with a power of 0.80 and a two-tailed α less than .05, we planned for 146 survivors per group. For all analyses, we used the intention-to-treat approach based on all available data at the

1 month and 3 month follow-ups. For all self-reported PA data, outliers remained in the data but were adjusted to 900 total PA minutes/week. Effect sizes (*d*) for all analyses were computed and interpreted as *d*=0.20 (small), *d*=0.50 (medium), and *d*=0.80 (large). Based on the unexpected number of YACS reporting >300 minutes/week of PA at baseline, we conducted additional exploratory analyses on the effects of the intervention in YACS reporting ≤300 minutes/week of PA at baseline.

Results

Figure 1 provides a summary of participant flow through the study. Of the 2,029 mailed surveys, 116 (6%) were returned because of a wrong address, 4 YACS were deceased and one was not diagnosed with cancer. A total of 212 YACS (11%) completed the survey and were randomized. Of the 212 YACS that completed the baseline survey 142 (67%) completed the one money survey and 128 (60%) completed the three month survey.

The groups were balanced at baseline (Table 1). The mean age of the participants was 32.7±4.9 years, 60.8% were female, 72.6% were married, 67.5% had completed university or college, 55.7% had a household income of more than $100,000, 85.4% were Caucasian and 84.9% were employed full or part time. The mean weekly minutes of PA was 214±240 with approximately half (49.5%) meeting the PA guidelines. The mean weekly minutes of PA for YACS reporting under 300 minutes of PA at baseline was 103±100 with approximately a third (31%) meeting the PA guidelines. The mean BMI of participants was 26.0±5.4 with 49.5% of participants being overweight or obese. The most common cancers

were lymphoma (17.0%), breast (16.0%) and thyroid (13.7%). Most of the participants (89.6%) had completed treatments at the time of the survey, 58.0% had received chemotherapy, 46.7% had received radiation and 78.8% had surgery.

Physical Activity Minutes

Mean number of minutes for total PA, vigorous PA, and moderate PA for baseline and one month are reported in Table 2. Change in PA minutes favored the CPAG group by 40 minutes (95% CI= -99 to +18) but the effect size was small (d=-.17) and was not statistically significant (p=.19). Mean number of minutes for total PA, vigorous PA, and moderate PA for baseline and three month are displayed in Table 3. Change in PA favored the TPAG group by 8 minutes (95% CI= -60 to +77) which was a trivial effect size (d=.03) and not statistically significant (p=.81).

Quality of Life and Psychosocial Variables

Mean scores for QoL and psychosocial variables at baseline and 3 months are presented in Table 4. MCS scores favored the TPAG group (95% CI=+0.1 to +7.3) by a small-to-medium effect size (d=.41) that was significantly (p=0.043). The stress scores also favored the TPAG group (95% CI -6.5 to +0.3) by a small-to-moderate effect size (d=.28) which was borderline significant (p=0.077).

Physical Activity Minutes for YACS Reporting ≤300 PA Minutes at Baseline

For the one month analyses, we excluded 34 (24%) YACS who reported ≥300 PA minutes/week at baseline including 17 (24%) in the TPAG group and 17 (24%) in the CPAG group (p=0.93). Mean scores of the minutes for total PA, vigorous PA, and moderate PA for baseline and one month for YACS reporting

fewer than 300 minutes at baseline are presented in Table 5. Change in PA minutes favored the TPAG group by 7 minutes (95% CI=-55 to +68) which was a trivial effect size (d=.04) and not statistically significant (p=.84). For the 3 month analyses, we excluded 32 (25%) YACS who reported ≥300 PA minutes/week at baseline including 17 (26%) in the TPAG group and 15 (24%) in the CPAG group (p=0.84).Mean scores of the minutes for total PA, vigorous PA, and moderate PA for baseline and three months for participants reporting fewer than 300 minutes at baseline are found in Table 6. Change in PA minutes favored the TPAG group by 90 minutes (95% CI= +10 to +170) which was a large effect size (d=.92) and statistically significant (p=0.028). The change in vigorous PA minutes also favored the TPAG group by 37 minutes (95% CI=+4 to +69) which was a large effect size (d=.97) and statistically significant (p=.026).

Quality of Life for YACS Reporting ≤300 PA Minutes at Baseline

Mean scores for QoL and psychosocial variables for YACS reporting less than 300 minutes of total PA/week at baseline are presented in Table 7. None of the variables showed statistical significance between groups; however the trend was in favor of the TPAG for MCS (p=0.14; d=.30) and was borderline significant for stress (p=.098) with a medium effect size (d= -.50).

Intervention Adherence and Evaluation

Similar adherence to the intervention was reported in both groups. In the TPAG group 47.7% read the guidebook in detail compared with 41.7% in the CPAG group (p=.92). Approximately the same number of YACS read the guidebook more than once in each group 28% of the TPAG group compared with

29% in the CPAG read the guidebook once, or once with specific sections more than once (p=.954).

In terms of evaluation, YACS in both the TPAG and the CPAG groups indicated the print materials were easy to understand (86.2%, 89.0%; p=.64) and informative (81.5%, 81.0%; p=.93), however, more YACS in the TPAG group (60.0%) than the CPAG group (33.3%) reported the print material was helpful for increasing PA (p=.003).

Discussion

Overall, the targeted PA guidebook for YACS did not increase PA compared to Canada's PA guide developed for the general adult population. One possible explanation for this finding is that the information in the guidebook was not relevant or helpful to YACS in increasing their PA beyond generic information. We do not believe that this is the case, however, because the guidebook was developed based on research examining the unique barriers, motives, and preferences of YACS [11]. Moreover, twice as many YACS reported the targeted guidebook to be helpful in increasing their PA compared to the generic guidebook. Consequently, another possible explanation that we feel is more likely is the high PA levels in the sample. Approximately one third of participants were reporting above 300 minutes of PA a week. We did not anticipate that so many highly active YACS would be interested in a study designed to increase PA. Future research may consider targeting only YACS with lower activity levels.

To explore the effects of our guidebook on YACS who may benefit from an increase in PA, we restricted a secondary analysis to YACS reporting less than 300 minutes of PA/week at baseline. At three months, the TPAG group reported 90 minutes of PA/week more than the CPAG group. This difference is a substantial intervention effect and suggests that our targeted PA guidebook is indeed superior to a generic PA recommendation in the population who needs it.

Interestingly, the TPAG had a significant positive effect on the mental component score of the SF-36 scale and a borderline significant effect on stress in the overall sample despite no differences in PA. It is unclear why the targeted guidebook would improve mental health without an increase in PA. One possible explanation is that reading through the targeted guidebook gave YACS more of a sense of control over PA. The targeted guidebook also could have provided a sense of community for YACS. A cancer diagnosis during the young adult years is rare [3] and YACS could have benefited from reading quotes from other YACS sharing similar experiences, and having similar barriers to PA. The same pattern of findings and effect size was resent for the <300 minute group but was not significant, perhaps due to the reduced sample size.

As previously mentioned, more YACS in the TPAG group than the CPAG group reported the print material was helpful for increasing PA. This is most likely due to the detail provided in the TPAG including overcoming barriers, planning, and how to stay safe during activity specific to YACS. The TPAG also offers an interactive component, for example, prompting YACS to answer questions about what benefits of exercise that are most important to them. This

engages YACS in the reading process. The CPAG is not interactive and very generic, and YACS may not find the information relevant or useful.

Our study is most similar to the ACTION Trial which was a randomized controlled trial designed to determine the effects of targeted PA print materials and step pedometers on PA and QoL in breast cancer survivors[4]. Breast cancer survivors were randomized to receive a breast cancer specific PA guidebook, a step pedometer, or both, and were compared to a standard PA recommendation. All three intervention arms reported a greater increase of PA than the standard PA recommendations by about 40-60 minutes/week. Our increase of 90 minutes/week is larger and may have resulted because of our focus on YACS, our more comprehensive guidebook, or our restriction of the analyses to YACS exercising fewer than 300 minutes/week. In the ACTION Trial, the combined group also reported significantly greater improved QoL than the standard recommendation group, which is consistent with our findings in both the overall and restricted sample.

There are several other studies examining PA print materials and other distance based behavioral change concepts. For example the FRESH START trial examined the efficacy of a tailored versus standard print material with the objective to improve diet quality and PA in diagnosed breast and prostate cancer survivors [28]. This study demonstrated an increase of 21 mins/week of PA favoring the tailored print material. Again, our trial demonstrated a larger effect of the print material.

Our study has important strengths and limitations. To our knowledge our study is the first to examine any behavioral intervention to increase PA in YACS. Moreover, we approached all YACS diagnosed in the last five years in Alberta from the cancer registry. We also used a randomized controlled trial design and compared our targeted intervention to the generic Canadian Physical Activity Guidelines rather than to no intervention at all. If YACS were to request PA information from cancer organizations in Canada, it is likely they would currently receive a copy of the Canadian Physical Activity Guidelines for adults.

Our study also has important limitations. First, our recruitment rate of 11% of eligible YACS was lower-than-expected and resulted in a smaller sample size than desired. Moreover, we had a modest follow-up rate at one (67%) and three (60%) months. These recruitment and retention rates are substantially lower than a similar trial in breast cancer survivors [12] that recruited 24% of eligible participants and had 89.7% retention to the study. Our study is similar to past research showing that YACS have a lower recruitment rate compared to other cancer groups [1]. This may be because YACS are at a very busy phase of life, arguably in the most productive years of their lives, and generally occupied with school, career, small children, and relationships, in addition to a potentially life threatening cancer diagnosis. Strategies for attracting and retaining YACS in lifestyle studies are needed. Another limitation is the self-report measures of PA and medical data. Despite these limitations our study provides the first data of the impact of a theory-based targeted PA guidebook for YACS on PA. Future research might combine the guidebook with other effective behavioral support

interventions such as an interactive website, or text messaging to provide ongoing support.

In summary, a targeted PA guidebook did not increase PA compared to a generic PA guidebook in a highly active sample of YACS. The targeted guidebook was effective, however, for YACS reporting less than 300 minutes of weekly PA at baseline, which is the target group of interest in any PA behavior change intervention. Moreover, the TPAG had a positive effect on mental QoL and stress of YACS in the overall and restricted sample. The creation and evaluation of this targeted PA guidebook provides a cost effective way to promote PA in YACS, which is important for improving quality of life and reducing morbidity.

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Figure 1. Flow chart of participants

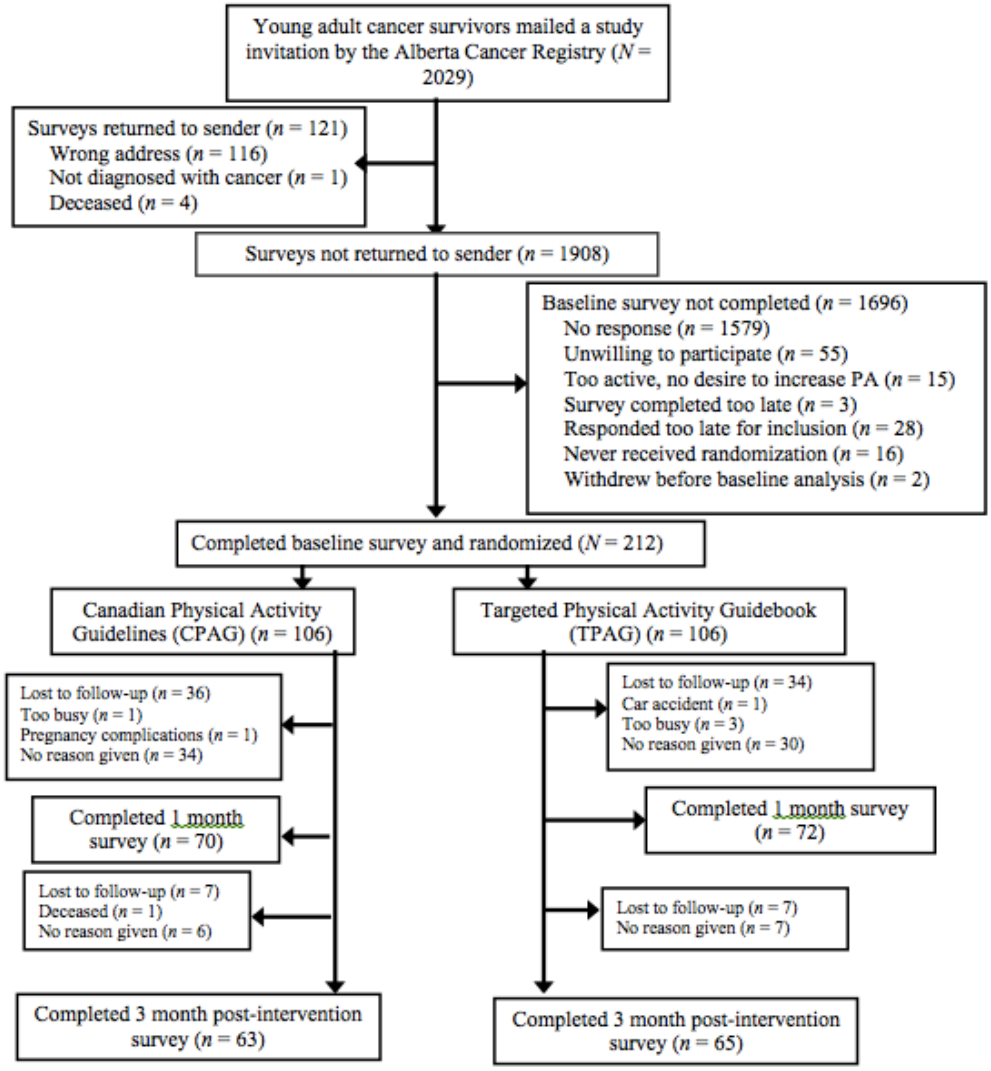

Table 1. Baseline demographic and medical characteristics of young adult cancer survivors overall and by group assignment, Alberta, Canada, June-November 2012.

Variable	Overall (N=212)	CPAG (n=106)	TPAG (n=106)	P value
Age, No. (%)				
18-29 years	55 (25.9%)	29 (27.4%)	26 (24.5%)	
30-39 years	157 (74.1%)	77 (72.6%)	80 (75.5%)	.87
Sex, No. (%)				
Male	83 (39.2%)	41 (38.7%)	42 (39.6%)	
Female	129 (60.8%)	65 (61.3%)	64 (60.4%)	.89
Marital status				
Married	154 (72.6%)	79 (74.5%)	75 (70.8%)	
Not married	58 (27.4%)	27 (25.5%)	31 (29.2%)	.54
Education				
≥Completed college	143 (67.5%)	68 (64.2%)	75 (70.8%)	
≤Some college	69 (32.5%)	38 (35.8%)	31 (29.2%)	.30
Annual family income				
<$100,000	94 (44.3%)	46 (43.4%)	48 (45.3%)	
≥$100,000	118 (55.7%)	60 (56.6%)	58 (54.7%)	.78
Ethnicity				
Caucasian	181 (85.4%)	98 (92.5%)	83 (78.3%)	
Other	31 (14.6%)	8 (7.5%)	23 (21.7%)	.004
Employment status				
Employed \	180 (84.9%)	91 (85.8%)	89 (84.0%)	
Not employed	32 (15.1%)	15 (14.2%)	12 (16.0%)	.70
Baseline Exercise, No. (%)				
Not meeting guidelines	107 (50.5%)	53 (50.0)	54 (50.9%)	
Meeting guidelines	105 (49.5%)	53 (50.0)	52 (49.1%)	.40
Body Mass Index, No. (%)				
Healthy	107 (50.5%)	50 (47.2%)	57 (53.8%)	
Overweight	65 (30.7%)	37 (34.9%)	28 (26.4%)	
Obese	40 (18.9%)	19 (17.9%)	21 (19.8%)	.41
Number of comorbidities				
None	152 (71.7%)	74 (69.8%)	78 (73.6%)	
>1	60 (28.3%)	32 (30.2%)	28 (26.4%)	.54
Smoking status				
Never smoked	142 (67.0%)	70 (66.0%)	72 (67.9%)	
Ex smoker	46 (21.6%)	26 (24.5%)	20 (18.9%)	
Current smoker	12 (11.4%)	10 (9.5%)	14 (13.2%)	.48

Table 1 (continued).

Variable	Overall (N=212)	CPAG (n=106)	TPAG (n=106)	P value
Drinking status				
Non-drinker	50 (23.6%)	27 (25.5%)	23 (21.7)	
Social drinker	150 (70.7%)	74 (69.8%)	76 (71.7)	
Regular drinker	12 (5.7%)	5 (4.7%)	7 (6.6)	.71
Type of Cancer, No. (%)				
Lymphoma	36 (17.0%)	19 (17.9%)	17 (16.0%)	
Breast	34 (16.0%)	21 (19.8%)	13 (12.3%)	
Thyroid	29 (13.7%)	14 (13.2%)	15 (14.2%)	
Testes	26 (12.3%)	10 (9.4%)	16 (15.1%)	
Leukemia	14 (6.6%)	5 (4.7%)	9 (8.5%)	
Cervix	13 (6.1%)	7 (6.6%)	6 (5.7%)	
Brain	13 (6.1%)	7 (6.6%)	6 (5.7%)	
Colorectal	8 (3.8%)	4 (3.8%)	4(3.8%)	
Other	39 (18.4%)	19 (17.9%)	20 (18.9%)	.79
Disease stage, No. (%)				
Stage I/II	96 (45.3%)	49 (46.2%)	47 (44.3%)	
Stage III/IV	54 (25.5%)	27 (25.5%)	27 (25.5%)	
Do not know	62 (29.2%)	30 (28.3%)	32 (30.2%)	.95
Current Treatment Status, No. (%)				
Completed	190 (89.6%)	95 (89.6%)	95 (89.6%)	
Receiving Treatment	22 (10.4%)	11 (10.4%)	11 (10.4%)	1.0
Current disease status				
Disease free	186 (87.7%)	95 (89.6%)	91 (85.8%)	
Current disease	26 (12.3%)	11 (10.4%)	15 (14.2%)	.40
Treatments received				
Chemotherapy	123 (58.0%)	65 (61.3%)	58 (54.7%)	.33
Radiation	99 (46.7%)	52 (49.1%)	47 (44.3%)	.49
Surgery	167 (78.8%)	88 (83.0%)	79 (74.5%)	.13
Time since diagnosis, No. (%)				
<60 months	148 (69.8%)	79 (74.5%)	69 (65.1%)	
≥60 months	64 (30.2%)	27 (25.5%)	37 (34.9%)	.14

CPAG= Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook

Table 2. Effects of Generic versus Targeted Print Materials on Physical Activity in Young Adult Cancer Survivors at One Month Follow-Up, Alberta, Canada, June-November 2012

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Physical Activity Minutes						
CPAG (n=70)	217 (242)	286 (233)	+69 [+23 to +114]	-40 [-99 to +18]	.19	-.17
TPAG(n=72)	215 (224)	240 (170)	+25 [- 26 to + 76]			
Vigorous Minutes						
CPAG (n=70)	73 (101)	87 (94)	+14 [- 6 to +36]	-9 [-34 to +16]	.47	-.09
TPAG (n=72)	68 (92)	75 (73)	+ 6 [-15 to +28]			
Moderate Minutes						
CPAG (n=70)	71 (81)	110 (97)	+39 [+16 to +63]	-23 [-52 to +5]	.11	-.28
TPAG (n=72)	78 (83)	90 (81)	+12 [- 10 to +34]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis.
CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 3. Effects of Generic versus Targeted Print Materials on Physical Activity in Young Adult Cancer Survivors at Three Month Follow-Up, Alberta, Canada, June-November 2012

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Physical Activity Minute						
CPAG (n=63)	223 (245)	269 (252)	+46[+2 to + 91]	+8 [-60 to +77]	.81	.03
TPAG (n=65)	228 (226)	285 (201)	+58 [+0 to +116]			
Vigorous Minutes						
CPAG (n=63)	73 (103)	90 (102)	+17 [- 1 to +35]	+9 [-20 to +38]	.54	.09
TPAG (n=65)	70 (91)	98 (84)	+28 [+4 to +52]			
Moderate Minutes						
CPAG (n=63)	76 (90)	89 (84)	+13 [-10 to +37]	-7 [-34 to +20]	.59	-.08
TPAG (n=65)	88 (88)	89 (73)	+ 2 [-20 to +23]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis.
CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

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Table 4. Effects of Generic versus Targeted Print Materials on Quality of Life at Three Month Follow-Up in Young Adult Cancer Survivors, Alberta, Canada, June-November, 2012.

Baseline M (SD)	Three Month M (SD)	Mean change M (SD)	[1]Adjustedgroup difference in mean change: M [95% CI]	p	Cohen's *d*
PCS					
CPAG (n=63)	46.9 (7.7)	52.4 (10.5)	+5.5 [+3.7 to +7.4]	+0.1 [-2.3 to +2.6]	.91	.01
TPAG(n=65)	48.0 (7.0)	53.7 (7.7)	+5.7 [+4.3 to +7.1]			
MCS					
CPAG (n=63)	46.1 (12.2)	41.7 (14.4)	-4.4 [-7.1 to - 1.6]	+3.1 [+0.1 to +7.3]	.043	.41
TPAG (n=65)	46.3 (9.8)	45.9 (9.9)	-0.4 [-2.5 to +1.8]			
Stress					
CPAG (n=63)	22.2 (8.7)	23.7 (10.0)	+1.5 [-1.5 to +4.6]	-3.2 [-6.5 to +0.3]	.077	-.28
TPAG (n=65)	23.1 (7.0)	21.6 (8.2)	- 1.5 [-4.4 to +1.3]			
Self Esteem						
CPAG (n=63)	32.2 (5.8)	33.1 (5.6)	+0.9 [+0.1 to +1.7]	+0.6 [-0.6 to +1.8]	.33	+.12	TPAG (n=65) 31.8 (4.7)
33.0 (4.8)			+1.1 [+0.2 to +2.0]			
Depression					
CPAG (n=63)	9.5 (3.2)	9.2 (3.3)	-0.4 [-0.3 to +1.0]	+0.1 [-0.8 to +1.0]	.85	.03
TPAG (n=65)	9.6 (3.2)	9.1 (2.8)	-0.5 [-1.0 to +0.2]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis.
CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook; PCS=Physical Component Summary; MCS=Mental Component Summary.

Table 5. Effects of Generic versus Targeted Print Materials on Physical Activity at One Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November 2012

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Physical Activity Minutes						
CPAG (n=53)	96 (92)	202 (166)	+106 [+57 to +156]	+7 [-55 to +68]	.84	.04
TPAG(n=55)	110 (108)	209 (147)	+ 99 [+59 to +139]			
Vigorous Minutes						
CPAG (n=53)	23 (36)	58 (71)	+34 [+13 to +56]	+7 [-20 to +33]	.61	.10
TPAG (n=55)	27 (42)	62 (63)	+34 [- 18 to +51]			
Moderate Minutes						
CPAG (n=53)	50 (62)	87 (87)	+37 [+13 to +61]	-5 [-38 to +28]	.74	-.06
TPAG (n=55)	55 (67)	85 (78)	+31 [+ 5 to +56]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis.
CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 6. Effects of Generic versus Targeted Print Materials on Physical Activity at Three Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Physical Activity Minutes						
CPAG (n=48)	99 (91)	168 (170)	+ 69 [+17 to +121]	+90 [+10 to +170]	.028	.92
TPAG (n=48)	115 (104)	250 (190)	+135 [+84 to +187]			
Vigorous Minutes						
CPAG (n=48)	23 (34)	50 (68)	+28 [+8 to +48]	+37 [+4 to +69]	.026	.97
TPAG (n=48)	28 (41)	85 (78)	+57 [+36 to +78]			
Moderate Minutes						
CPAG (n=48)	54 (63)	68 (64)	+13 [-13 to +40]	+16 [-13 to +45]	.27	.25
TPAG (n=48)	58 (64)	79 (70)	+22 [+ 3 to +41]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis.
CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

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Table 7. Effects Generic versus Targeted Print Materials on Quality of Life at Three Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjustedgroup difference in mean change: M [95% CI]	p	Cohen's *d*
PCS						
CPAG (n=48)	46.6 (8.3)	51.9 (11.3)	+5.3 [+3.0 to +7.6]	+0.9 [-2.0 to +3.8]	.54	.11
TPAG(n=48)	47.1 (7.5)	53.0 (8.4)	+6.0 [+4.5 to +7.5]			
MCS						
CPAG (n=48)	45.6 (11.9)	41.6 (11.9)	-4.0 [-7.2 to - 0.8]	+3.2 [-1.1 to +7.5]	.14	.30
TPAG (n=48)	44.4 (9.7)	43.8 (10.1)	-0.6 [-3.4 to +2.2]			
Stress						
CPAG (n=48)	23.2 (7.5)	23.6 (9.7)	+0.4 [-2.6 to +3.4]	-3.4 [-7.4 to +0.6]	.098	-.50
TPAG (n=48)	25.0 (6.1)	21.6 (8.1)	- 3.4 [-6.4 to - 0.3]			
Self Esteem						
CPAG (n=48)	32.0 (5.0)	33.0 (5.1)	+1.0 [+0.0 to +2.0]	+0.5 [-1.1 to +2.1]	.54	.10
TPAG (n=48)	30.8 (4.5)	32.0 (4.7)	+1.2 [+0.8 to +2.3]			
Depression						
CPAG (n=48)	9.2 (2.6)	9.0 (3.2)	-0.3 [-1.1 to +0.5]	+0.2 [-0.9 to +1.4]	.68	.06
TPAG (n=48)	10.0 (3.5)	9.7 (2.9)	-0.3 [-1.2 to +0.6]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis.
CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook; PCS=Physical Component Summary; MCS=Mental Component Summa

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Chapter 7

Analyzing theoretical mechanisms of physical activity behavior change in young adult cancer survivors: Results from targeted vs generic print material study

Physical activity (PA) is an effective intervention for young adult cancer survivors (YACS) to improve quality of life (QoL) and other psychosocial variables including stress, depression and self-esteem [1]. PA has also demonstrated a protective benefit for some cancer survivor groups against recurrence, cancer related death and all cause mortality [2-3]. YACS have indicated they have the desire for information about PA, and are willing and able to do a PA program. Yet, only half of YACS report being physically active [1]. Given these findings and the potential years of survivorship for YACS, studies are needed to increase PA in YACS.

Behaviour change interventions should be theory based [4]. The use of behavioural theories can aid researchers in understanding the mechanisms through which individuals change (or do not change) their behaviors. Analyzing the theory-based mediating variables in randomized controlled trials has an important role in understanding the pathways to behaviour change [5]. The theory of planned behaviour (TPB) is one model that has been used to explain PA intention and behaviour in cancer survivors [6-11], including YACS [12]. The TPB is a social cognitive model of human behaviour that proposes that intention (ie, how hard one is willing to try) is the key determinant of behaviour. Intention, in turn, is influenced by perceived behavioural control (PBC; controllability of

behaviour), self-efficacy (confidence of performing the behaviour), affective attitude (expected enjoyment in performing the behaviour), instrumental attitude (expected benefits from performing the behaviour), injunctive norm (anticipated support from important people for performing the behaviour), and descriptive norm (the extent to which important people perform the behaviour themselves). In addition, planning (detailed plan on how to accomplish the behaviour) has been proposed as a critical variable for translating intentions into behaviour [13]. Overall, studies have provided promising evidence that the TPB could be a useful model for understanding PA behaviour in cancer survivors. Theory based PA interventions may provide researchers and practitioners insight into ideal methods to promote PA behaviour change in YACS.

We recently completed a behaviour change intervention designed to increase PA in YACS [14]. The study was a randomized controlled trial designed to determine the effects of PA print material targeted to YACS (TPAG) based on the TPB model compared to the Canadian physical activity guidelines (CPAG). We previously reported the development and evaluation of the TPAG called "Stride to Survive: An Exercise Guide for Young Adult Cancer Survivors" [15]. We have also reported that the TPAG did not increase PA compared to the CPAG in the overall sample of YACS, however, the TPAG was effective in increasing PA in less active YACS (defined as performing <300 minutes of PA/week at baseline)[14].

The primary purpose of this study was to examine the effects of our intervention on the TPB constructs and determine if the TPB explained the lack of

effect of our intervention in the overall sample and the significant effect in the less active subsample. Based on our findings related to PA, we hypothesized that the TPAG would not have significant effects on the TPB constructs in the overall sample; however, we expected the TPAG to have significant effects on the TPB constructs in the less active YACS.

Methods

Sample and Procedures

The methods of the study have been reported comprehensively elsewhere [14]. In brief, the study was a two-armed prospective randomized controlled trial. The Alberta Cancer Registry was used to identify and contact 2,029 young adult cancer survivors within 5 years of diagnosis. The eligibility criteria included (a) diagnosed with any invasive cancer between the ages of 18-39 and still within that age range, (b) within 5 years of cancer diagnosis, (c) free from chronic medical and orthopedic conditions that would preclude PA, (d) able to read and understand English and (e) interested in increasing PA by 60 moderate minutes or 30 vigorous minutes/week.

YACS were mailed an invitation letter to participate in the study and were asked to contact the research group if interested in participation. Interested participants were emailed a link to the on-line baseline survey. Completion of the baseline survey resulted in randomization. YACS in both groups were asked to complete surveys at baseline, one month and three months post randomization. Surveys were completed online using Survey Monkey. At one and three months

post baseline survey, YACS were prompted by an email to complete the follow up surveys. In the email, there was a direct link to the survey.

Interventions

The CPAG group received the Canadian PA Guidelines which is a one page (8"x11") handout developed for healthy adults 18-64 years of age. The guidelines recommend that adults obtain at least 150 minutes of moderate to vigorous aerobic PA a week, and more PA has even greater health benefits. The guidelines address in brief how to measure intensity of PA, possible health benefits of PA, and how to create time for PA. The guidelines were developed based on several reviews of the health benefits of PA in adults [16].

The TPAG group received the guidebook called "Strive to Survive" which was previously developed and evaluated by expert judges for suitability and content for YACS [15]. The guidebook is a 8" x 6.5" bound book with 58 pages, and is based on the theoretical components of the TPB [15]. The guidebook has 11 chapters and a tear out planning sheet. The information for the guidebook was formulated based on PA preferences of YACS elicited from a previous study[17] and the TPB [18]. Chapter 1 served as an introduction to the guidebook. Instrumental attitudes were targeted in chapter 2 covering topics such as PA as a means of stress relief, and preventing disease. PBC, planning and self-efficacy were addressed in chapters 3, 5, 6, 7 discussing topics such as the principles of exercise training, time management, goal setting, overcoming barriers to PA and what to do in bad weather. Chapter 4 and 11 addressed PBC by describing exercise safety and precautions and what to do if YACS have a lapse in PA.

Chapter 8 addressed affective attitude describing how to make PA fun. Chapters 9 and 10 discussed normative beliefs describing how to get social support for PA. The final chapter targeted planning as it described how to set up an exercise program. The guidebook included participant centered activities, which were designed to facilitate participant engagement in the information as well as control over the behavior including an environmental scan, time management worksheet, and PA tracking sheet.

Measures

Demographic and medical characteristics were collected by self-report and included age, sex, marital status, education, family income, employment status, height, weight, comorbidities, ethnicity, body mass index (BMI, to be calculated by height and weight), cancer type, months since diagnosis, stage of cancer, treatments (chemotherapy, surgery radiation), treatment status, and disease status.

Physical Activity was assessed by the Leisure Score Index (LSI) from the Godin Leisure Time Exercise Questionnaire (GLTEQ) [19]. The LSI assesses the average weekly frequency and duration over the past month of the three levels of intensity of PA: light, moderate, and vigorous. The LSI has established reliability and concurrent validity based on various criteria[20]. PA minutes/week was calculated for moderate and vigorous PA minutes. For total PA minutes (the combination of moderate and vigorous PA minutes) vigorous minutes were double weighted, as suggested in the US Department of Health and Human Services recommendations for PA [21].

Planning to engage in PA was assessed using five items rated on a seven point scale (1= no plans and 7=detailed plans). The statement was made "I have made detailed plans concerning…" followed by (1) 'when' I am going to engage in PA over the next month, (2) 'where' I am going to engage in regular PA over the next month, (3) 'what' kind of regular PA I am going to engage in for regular PA over the next month, (4) 'how' I am going to get to a place to engage in regular PA over the next month, and (5) 'who' I am going to be physically active with over the next month.

Intention to exercise was assessed using two items rated on seven-point scales: (1) "Do you intend to do regular PA over the next month?" (no, not really to strongly intend) and (2) "How motivated are you to do regular PA over the next month?" (not motivated at all to extremely motivated).

Attitude was measured by a seven point scale for affective (unenjoyable-enjoyable, plainful-pleasurable, boring-fun) and instrumental (useless-useful, harmful-beneficial, unimportant-important). The statement that preceded the adjectives was "I think that for me to participate in regular PA over the next month would be:"

Subjective norm was measured by six items on a seven point scale. Injunctive norms were assessed by the statement "I think that if I participated in PA over the next month, most people who are important to me would be…" with the following bipolar adjective scales: disapproving-approving, discouraging-encouraging, unsupportive-supportive. Descriptive norms items were (1) I think over the next month, most people that were important to me will be." (extremely

inactive-extremely active), (2) "I think that over the next month, most people who are important to me will themselves participate regularly in PA" (strongly disagree- strongly agree) and (3) "I think over the next month, the PA levels of most people who are important to me will be" (extremely low- extremely high).

Perceived behavioural control was measured by three controllability items which were (1) "How much control would you have over doing PA over the next month" (very little control-complete control), (2) "Whether or not I engage in regular PA over the next month is completely up to me" (strongly disagree-strongly agree), (3) "How much do you feel that engaging in PA over the next month is beyond your control" (not at all-very much). Three self-efficacy items were also measured including (1) "For me, participating in regular PA over the next month would be" (extremely difficult-extremely easy), (2) "If I wanted to, I could easily engage in regular PA over the next month" (strongly disagree to strongly agree), and (3) "How confident are you that you could do regular PA over the next month?" (not confident at all- completely confident).

Behavioral, normative and control beliefs were based on responses to open ended belief questions on a previous cross sectional survey of YACS [12].

The *behavioural beliefs* focused on the perceived benefits of participating in regular PA and judged on a scale from 1 through 7. The behavioural belief items were preceded by the statement "If you were to do regular PA over the next month, do you think you would…" (extremely unlikely to extremely likely). Behavioral Beliefs included both instrumental and affective attitude behavioural beliefs. Instrumental behavioural beliefs included lose/control weight, feel

fit/healthy, improve energy, improve endurance, improve strength, have better health, improve mood, feel better, reduce stress, better sleep, reduce risk of cancer coming back, reduce chance of other disease and live longer. Affective attitude behavioural beliefs included exercise with other people, listening to music while exercising, do a variety of activities, see improvements from exercising, socialize/meet new people while exercising, and exercising in a group.

The *normative beliefs* addressed the extent to which important specific others would be supportive of exercising regularly and included both injunctive and descriptive normative beliefs. The injunctive normative beliefs were friends, spouse/partner, family members, children, co-workers, and parents and were preceded by the statement "How supportive do you think each of the following people would be if you tried to do regular PA over the next month?" (unsupportive-supportive). Descriptive normative beliefs were preceded by the statement "How likely do you think it is that each of the following people would engage in PA over the next month" (extremely unlikely- extremely likely). For this item, YACS were asked to leave it blank if the category did not apply to them (e.g., leave the children item blank if you do not have children).

Control beliefs were measured on a seven point scale from not at all confident to completely confident. The statement that preceded was "If you were really motivated, how confident are you that you could do regular PA over the next month even if…". PBC control beliefs included too busy/had limited time, had family responsibilities, had work responsibilities, had no motivation, were tired, the weather was bad, and had limited or no access to recreation facility/gym.

Statistical Analyses

Analyses were performed using SPSS version 19 (Chicago, IL). We conducted analyses of covariance (ANCOVA) comparing the two groups in the overall sample and less active subsample on the TPB global constructs and salient beliefs. The analyses were adjusted for important demographic and medical variables including baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. For all analyses, we used the intention-to-treat approach based on all available data at the 1 month and 3 month follow-ups. Effect sizes (*d*) for all analyses were computed and interpreted as *d*=0.20 (small), *d*=0.50 (medium), and *d*=0.80 (large).

We conducted a path analysis separately for TPB constructs at one and three month follow up and for the overall sample and less active YACS. Our path analysis followed Pedhazur [22], wherein each variable in the model is regressed on all prior predictors. Each path analysis consisted of nine regression models. In the first model, PA minutes was regressed on all prior variables, that is, the eight TPB constructs and intervention group (coded as CPAG=0 and TPAG=1). Constructs that emerged with significant standardized betas are shown by a direct path to PA. In the second model, planning was regressed on all remaining constructs. Constructs that emerged with a significant standardized betas are shown by a direct path to planning. The third model was for intention. In the fourth, fifth, sixth, seventh, eighth and ninth models, affective attitude, instrumental attitude, injunctive norm, descriptive norm, self-efficacy and

perceived behavioral control were regressed on intervention. All significant standardized betas are depicted as direct paths to the construct.

Results

Participant Characteristics

Flow of participants through the study has been reported elsewhere [14]. In brief, 2,029 YACS were mailed surveys, 116 (6%) were returned because of a wrong address, 4 YACS were deceased and one was not diagnosed with cancer. Of the remaining 1908, 1579 did not respond, 55 indicated they were unwilling to participate, 15 felt they were too active or had no desire to increase their PA, 28 responded too late for inclusion, 16 participants never received randomization, 2 withdrew before baseline analysis, and 3 responded to the survey too late for inclusion. A total of 212 YACS (11%) completed the survey and were randomized. Of the 212 YACS that completed the baseline survey 142 (67%) completed the one month survey, 128 (60%) completed the three month survey, and 115 (54%) completed both the one and three month survey.

Baseline characteristics of YACS participating in this study are reported elsewhere [14]. The groups were balanced at baseline on major demographic factors and adherence to the intervention. The mean age of the participants was 32.7±4.9 years, 60.8% were female, 72.6% were married, 67.5% had completed university or college, 55.7% had a household income of more than $100,000, 85.4% were Caucasian and 84.9% were employed full or part time. The mean weekly minutes of PA was 214±240 with approximately half (49.5%) meeting the

PA guidelines. The mean weekly minutes of PA for YACS reporting under 300 minutes of PA at baseline was 103±100 with approximately a third (31%) meeting the PA guidelines. The mean BMI of participants was 26.0±5.4 with 49.5% of participants being overweight or obese. The most common cancers were lymphoma (17.0%), breast (16.0%) and thyroid (13.7%). Most of the participants (89.6%) had completed treatments at the time of the survey, 58.0% had received chemotherapy, 46.7% had received radiation and 78.8% had surgery.

Effects on the TPB Constructs

Descriptive statistics and adjusted group differences are reported for the one month follow-up in Table 1 and three month follow-up in Table 2 for the overall sample. There were no statistically significant effects of the intervention on TPB constructs at one month. At three months, the TPAG group had a more favorable affective attitude (mean difference= 0.4; 95% CI=0.1 to 0.7; d=0.40; p=0.003).

Descriptive statistics and adjusted differences TPB change scores between the CPAG and TPAG of YACS that reported under 300 PA minutes at baseline for the one month follow up on Table 3 and for three month follow up on Table 4. There was no statistically significant effects of the intervention at the one month follow up. At three months, the TPAG had a more favorable affective attitude (mean difference= 0.4; 95% CI=0.1 to 0.8; d=0.4; p=0.026), descriptive norm (mean difference= 0.5; 95% CI=0.0 to 1.0; d=0.38; p=0.003), and PBC (mean difference= 0.6; 95% CI=-0.1 to 1.3; d=1.2; p=0.07).

Explaining the Intervention Effects on PA Behavior by TPB Variables

In the path analysis of the overall sample (see figure 1) using the TPB constructs at one month and PA at three months, we found affective attitude (β=0.21, p=0.04) and intention (β=0.22, p=0.02) had direct effects on exercise. Intention (β=0.56, p<0.001) and self-efficacy (β=0.22, p=0.02) had direct effects on planning. Affective attitude (β=0.12, p=0.10), descriptive norm (β =0.16, p=0.03), injunctive norm (β =0.25, p=0.002), and self-efficacy (β =0.56, p<0.001) had direct effects on intention. Consistent with the ANCOVAs, the intervention had no effects on the TPB constructs at one month follow-up.

In the path analysis of less active YACS (see figure 2) using the TPB constructs at one month and PA at three months, we found that intention (β =0.41, p=0.01) had a direct effect on PA. Intention (β =0.41, p=0.01) also had a direct effect on planning. Descriptive norm (β=0.21, p=0.01), injunctive norm (β=0.21, p=0.04) and self-efficacy (β=0.60, p<0.001) had direct effects on intention. Consistent with the ANCOVA results, the intervention had no effects on the TPB constructs at one month follow-up.

In the path analysis of less active YACS (figure 3) using the TPB constructs at three months and PA at three months, we found that affective attitude (β=0.44, p<0.001) had a direct effect on PA. Intention (β=0.77, p<0.001) had a direct effect on planning. Self-efficacy (β=0.67, p<0.001) had a direct effect on intention. Consistent with the ANCOVA results, the intervention had a direct effect on affective attitude (β=0.25, p=0.01) and perceived behavioural control (β =0.17, p=0.10). Contrary to the ANCOVA results, the intervention did not have

an effect on descriptive norm, presumably because the regression models were not adjusted for baseline covariates as in the ANCOVAs.

Changes in Salient PA Beliefs

At one month in the overall sample (table 9), the TPAG group was superior to the CPAG for the instrumental belief that exercise would 'improve strength' (mean difference= 0.3; 95% CI=-0.0 to 0.6; d=0.33; *p*=0.078). At three months in the overall sample (table 8), the CPAG group was superior to the TPAG for the instrumental belief that exercise would 'reduce the chance of other chronic diseases' (mean difference= -0.3; 95% CI=-0.7 to 0.0; d=-0.23; *p*=0.072).

At one month for less active YACS (table 11), the TPAG was superior to the CPAG for the affective belief that they would 'see improvements from exercising' (mean difference= 0.3; 95% CI=-0.1 to 0.7; d=0.37; *p*=0.088) and for the control belief (table 12) that they could exercise if they 'had limited or no access to recreation facility/gym' (mean difference= 0.6; 95% CI=-0.3 to 1.3; d=0.36; *p*=0.062). At 3 months (table 15), the TPAG was superior to CPAG for the control belief they that could exercise if they ' had limited or no access to recreation facilities' (mean difference= 0.6; 95% CI=-0.1 to 1.4; d=0.33; *p*=0.089).

Discussion

Consistent with our hypothesis, the TPAG did not have significant effects on the TPB constructs for the overall sample except for the adjusted group difference for affective attitude at three month follow-up. Moreover, the intervention also had minimal effects on the underlying saliant beliefs. In the path

analysis with the full sample of YACS at the one month follow up, the intervention did not have an effect on TPB. Perceived enjoyment (affective attitude), normative influences (both descriptive and injunctive) and self-efficacy influenced YACS intention to exercise. Self-efficacy had a direct influence on creating plans for PA. Affective attitude and intention had a direct influence on PA. Intention also influenced YACS creation of plans for PA. The formation of plans to participate in PA did not influence PA. Consequently, the TPB was efficient at explaining PA behaviour in YACS, however, the intervention did not affect the TPB constructs in the path analysis or the difference in scores between the TPAG and the CPAG. These data suggest that the problem was with our intervention and not with the theory. It is also possible that the null effect of the TPAG on the TPB may be explained by the highly active sample and the high baseline scores of YACS participating in this study. In order for the TPB based intervention to be effective there needs to be the capacity for improvement [23].

Our hypothesis for less active YACS was partially supported. The TPAG did not have significant effects on the TPB variables at the one month follow up; however, at the three month follow up the TPAG reported superior scores for affective attitude and PBC as well as adjusted differences for descriptive norms. This difference based on time lapsed could be that the CPAG originally triggered a change in the TPB, however the TPAG had a more lasting change on affective attitude, descriptive norm and PBC. Although the temporal sequencing no longer holds true, we did a path analysis of TPB variables and PA minutes results at the 3 month follow up. This path analysis demonstrated the intervention had an effect

on affective attitude and perceived behavioural control, which were the two main constructs we were trying to target with the TPAG based on previous TPB research. Affective attitude also had a direct effect on PA thereby providing a mediated path from the intervention to PA. These results are similar to other studies [24] that highlight the importance of targeting the individual's enjoyment of PA.

The intervention had limited effects on the underlying beliefs about PA for less active YACS, however there were a few to note. At the one month follow up, the TPAG scored higher on the affective belief that PA would lead to 'seeing improvements from exercise' and the control belief that they could do PA even if they 'had limited or no access to recreation facility/gym'. At the three month follow up, the TPAG group were still more confident they could exercise even if they 'had limited or no access to recreation facility/gym'. The TPAG directly addressed improvements from exercise whereas the CPAG does not go into any detail on improvements from PA. Moreover, the TPAG addressed opportunities to exercise outside a facility because our previous research [12] showed that over half of YACS preferred to do activity outside in their neighbourhoods or at home; and the majority did not have a membership to a fitness center.

Our study has important strengths and limitations to consider when interpreting our results. To our knowledge, our study is the first to examine the TPB to understand the effects of targeted PA materials in YACS. Moreover, we approached all YACS diagnosed in the last five years in Alberta from the cancer registry. We also used a randomized controlled trial design and compared our

targeted intervention to the generic Canadian Physical Activity Guidelines rather than to no intervention at all. Currently, if YACS were to request PA information from cancer organizations in Canada, they would likely be given a copy of the Canadian Physical Activity Guidelines.

Our study also has important limitations. First, our recruitment rate of 10% of eligible YACS was lower than expected and resulted in a smaller sample size than desired. Moreover, we had a modest follow-up rate at one (67%) and three (60%) months. These recruitment and retention rates are substantially lower than a similar trial in breast cancer survivors [24] that recruited 24% of eligible participants and had a 90% retention to the study. Our study is similar to past research showing that YACS have a lower recruitment rate compared to other cancer groups [24]. This may be because YACS are at a very busy phase of life, and generally occupied with school, career, small children, and relationships, not to mention a potentially life threatening cancer diagnosis. Strategies for attracting and retaining YACS in lifestyle studies are needed. Another limitation is the self-report measure of PA, which could be strengthened by the addition of objective fitness measures or activity measures such as a pedometer or accelerometer. Medical data was also self-reported which is a limitation which can be strengthened by collecting medical data from medical charts.

Despite these limitations, our study provides the first data of the impact of a theory-based targeted PA guidebook for YACS on PA. This study has demonstrated that the TPB was a valid theory for predicting PA behavior in YACS, however, the intervention failed to change the TPB constructs in the

overall sample. For less active YACS, the intervention was effective for changing affective attitude, descriptive norms, and PBC. Moreover, the change in affective attitude provided a direct pathway to PA behavior change. Future research might combine the guidebook with other effective behavioral support interventions such as an interactive website, social media, telephone counseling, or text messaging to provide ongoing support.

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Table 1. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Constructs in Young Adult Cancer Survivors at One Month Follow-Up, Alberta, Canada, June-November 2012.

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Instrumental attitude						
CPAG (n=70)	6.4 (0.7)	6.1 (0.9)	-0.3 [-0.5 to -0.0]	-0.0 [-0.3 to +0.3]	.80	-.00
TPAG (n=72)	6.4 (0.7)	6.3 (1.0)	-0.1 [-0.3 to +0.1]			
Affective attitude						
CPAG (n=70)	5.2 (1.0)	5.3 (1.1)	+0.0 [-0.2 to +0.3]	-0.1 [-0.2 to +0.4]	.46	-.10
TPAG (n=72)	5.3 (0.9)	5.3 (0.9)	-0.0 [-0.3 to +0.3]			
Injunctive norm						
CPAG (n=70)	6.2 (0.9)	6.0 (1.0)	-0.2 [-0.4 to +0.0]	+0.1 [-0.2 to +0.4]	.68	.12
TPAG (n=72)	6.2 (0.8)	6.0 (1.1)	-0.2 [-0.4 to -0.0]			
Descriptive norm						
CPAG (n=70)	5.0 (1.5)	4.7 (1.5)	-0.4 [-0.6 to -0.1]	-0.3 [-0.7 to +0.0]	.12	-.21
TPAG (n=72)	4.5 (1.5)	4.7 (1.2)	+0.2 [-0.1 to +0.4]			
Self-efficacy						
CPAG (n=70)	5.3 (1.1)	5.4 (1.3)	+0.1 [-0.2 to +0.3]	+0.0 [-0.3 to +0.5]	.52	.00
TPAG (n=72)	5.4 (1.3)	5.4 (1.3)	-0.1 [-0.3 to +0.2]			
Perceived Behavioral Control						
CPAG (n=70)	4.6 (0.5)	4.7 (0.6)	+0.1 [-0.1 to +0.3]	+0.0 [-0.2 to +0.2]	.77	-.00
TPAG (n=72)	4.7 (0.6)	4.8 (0.6)	+0.1 [-0.0 to +0.3]			
Planning						
CPAG (n=70)	4.2 (1.7)	4.8 (1.5)	+0.6 [+0.2 to +0.9]	+0.3 [-0.2 to +0.7]	.20	.18
TPAG(n=72)	4.2 (1.8)	4.7 (1.6)	+0.4 [+0.1 to +0.8]			

Intention						
CPAG (n=70)	5.8 (1.1)	5.7 (1.3)	-0.1 [-0.4 to +0.1]	-0.0 [-0.4 to +0.4]	.87	-.00
TPAG (n=72)	5.5 (1.5)	5.8 (1.3)	+0.2 [-0.1 to +0.5]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 2. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Constructs in Young Adult Cancer Survivors at Three Month Follow-Up, Alberta, Canada, June-November 2012.

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Instrumental attitude						
CPAG (n=63)	6.4 (0.7)	6.0 (1.2)	-0.4 [-0.7 to -0.1]	+0.2 [-0.2 to +0.5]	.32	.29
TPAG (n=65)	6.4 (0.7)	6.3 (0.8)	-0.1 [-0.3 to +0.1]			
Affective attitude						
CPAG (n=63)	5.2 (1.0)	5.0 (1.2)	-0.2 [-0.4 to +0.0]	+0.4 [+0.1 to +0.7]	.003	.40
TPAG (n=65)	5.2 (1.0)	5.6 (0.9)	+0.3 [+0.1 to +0.5]			
Injunctive norm						
CPAG (n=63)	6.3 (0.8)	5.9 (1.2)	-0.4 [-0.8 to -0.1]	+0.2 [-0.2 to +0.5]	.30	.25
TPAG (n=65)	6.3 (0.8)	6.1 (0.8)	-0.2 [-0.3 to +0.0]			
Descriptive norm						
CPAG (n=63)	5.0 (1.5)	4.7 (1.4)	-0.3 [-0.6 to +0.1]	+0.4 [-0.3 to +0.8]	.14	.27
TPAG (n=65)	4.9 (1.5)	4.9 (1.2)	+0.1 [-0.1 to +0.5]			
Self-efficacy						
CPAG (n=63)	5.1 (1.2)	5.0 (1.8)	-0.1 [-0.5 to +0.3]	-0.0 [-0.6 to +0.5]	.93	-.00
TPAG (n=65)	5.1 (1.2)	5.3 (1.3)	+0.2 [-0.5 to +0.1]			
Perceived Behavioral Control						
CPAG (n=63)	4.6 (0.5)	4.7 (0.7)	+0.0 [-0.1 to +0.2]	+0.3 [-0.2 to +0.3]	.80	.58
TPAG (n=65)	4.6 (0.5)	4.8 (0.6)	+0.1 [-0.2 to +0.2]			
Planning						
CPAG (n=63)	4.2 (1.8)	4.4 (2.1)	+0.2 [-0.3 to +0.7]	+0.0 [-0.7 to +0.7]	.97	.00
TPAG (n=65)	4.2 (1.8)	4.5 (2.1)	+0.2 [-0.3 to +0.8]			

Intention						
CPAG (n=63)	5.8 (1.1)	5.1 (1.8)	-0.7 [-1.1 to -0.3]	+0.2 [-0.4 to +0.8]	.42	.18
TPAG (n=65)	5.5 (1.1)	5.3 (1.8)	-0.2 [-0.6 to +0.2]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 3. Effects of Generic versus Targeted Print Materials on Theory of Planned Behavior Constructs at One Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November 2012

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Instrumental attitude						
CPAG (n=53)	6.4 (0.6)	6.2 (0.7)	-0.2 [-0.5 to -0.0] `	+0.0 [-0.3 to +0.4]	.90	.00
TPAG (n=55)	6.3 (0.8)	6.2 (1.1)	-0.1 [-0.4 to +0.2]			
Affective attitude						
CPAG (n=53)	5.1 (1.0)	5.2 (1.0)	+0.2 [-0.1 to +0.4]	-0.2 [-0.6 to +0.2]	.13	-.29
TPAG (n=55)	5.2 (0.9)	5.2 (1.0)	-0.0 [-0.3 to +0.3]			
Injunctive norm						
CPAG (n=53)	6.2 (0.8)	6.1 (0.9)	-0.1 [-0.4 to +0.1]	-0.2 [-0.5 to +0.2]	.26	-.24
TPAG (n=55)	6.1 (0.9)	6.0 (1.1)	-0.2 [-0.4 to +0.1]			
Descriptive norm						
CPAG (n=53)	5.0 (1.3)	4.7 (1.4)	-0.3 [-0.5 to +0.0]	+0.3 [-0.1 to +0.7]	.21	.23
TPAG (n=55)	4.4 (1.6)	4.6 (1.3)	+0.2 [-0.1 to +0.5]			
Self-efficacy						
CPAG (n=53)	5.2 (1.0)	5.3 (1.3)	+0.1 [-0.3 to +0.4]	-0.2 [-0.6 to +0.3]	.47	-.15
TPAG (n=55)	5.3 (1.4)	5.2 (1.3)	-0.1 [-0.5 to +0.2]			
Perceived Behavioral Control						
CPAG (n=53)	4.7 (0.5)	4.8 (0.5)	+0.1 [-0.0 to +0.3]	+0.0 [-0.2 to +0.3]	.78	.00
TPAG (n=55)	4.7 (0.6)	4.9 (0.7)	+0.2 [-0.0 to +0.4]			
Planning						
CPAG (n=53)	4.0 (1.7)	4.6 (1.6)	+0.6 [+0.1 to +1.0]	-0.3 [-0.8 to +0.3]	.35	-.17
TPAG (n=55)	4.1 (1.9)	4.5 (1.5)	+0.4 [-0.0 to +0.9]			

Intention						
CPAG (n=53)	5.7 (1.1)	5.6 (1.3)	-0.1 [-0.5 to +0.2]	-0.1 [-0.7 to +0.4]	.68	-.08
TPAG (n=55)	5.4 (1.5)	5.6 (1.4)	+0.2 [-0.2 to +0.5]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 4. Effects of Generic versus Targeted Print Materials on Theory of Planned Behavior Constructs at Three Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Instrumental attitude						
CPAG (n=48)	6.4 (0.6)	6.0 (1.2)	-0.4 [-0.8 to -0.1]	+0.3 [-0.2 to +0.7]	.25	.46
TPAG (n=48)	6.3 (0.7)	6.2 (0.8)	-0.0 [-0.3 to +0.2]			
Affective attitude						
CPAG (n=48)	5.1 (1.0)	4.9 (1.2)	-0.2 [-0.5 to +0.1]	+0.4 [+0.1 to +0.8]	.026	.40
TPAG (n=48)	5.1 (1.0)	5.5 (1.0)	+0.3 [+0.0 to +0.6]			
Injunctive norm						
CPAG (n=48)	6.3 (0.7)	5.8 (1.3)	-0.5 [-0.9 to -0.2]	+0.2 [-0.2 to +0.7]	.31	.28
TPAG (n=48)	6.2 (0.8)	6.0 (0.9)	-0.2 [-0.4 to +0.0]			
Descriptive norm						
CPAG (n=48)	4.9 (1.3)	4.6 (1.4)	-0.3 [-0.7 to +0.1]	+0.5 [-0.0 to +1.0]	.057	.38
TPAG (n=48)	4.5 (1.5)	4.9 (1.3)	+0.4 [-0.0 to +0.7]			
Self-efficacy						
CPAG (n=48)	5.0 (1.1)	4.8 (1.8)	-0.2 [-0.8 to +0.3]	+0.3 [-0.4 to +1.0]	.35	.27
TPAG (n=48)	5.4 (1.2)	5.2 (1.3)	-0.2 [-0.6 to +0.2]			
Perceived Behavioral Control						
CPAG (n=48)	4.6 (0.5)	5.1 (1.7)	+0.5 [+0.0 to +1.0]	+0.6 [-0.1 to +1.3]	.070	1.2
TPAG (n=48)	4.8 (0.5)	5.6 (1.2)	+0.9 [+0.5 to +1.3]			
Planning						
CPAG (n=48)	4.0 (1.7)	4.2 (2.1)	+0.2 [-0.4 to +0.9]	+0.3 [-0.6 to +1.2]	.48	.18
TPAG (n=48)	4.0 (1.7)	4.4 (2.0)	+0.3 [-0.3 to +0.9]			

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Intention						
CPAG (n=48)	5.7 (1.1)	4.8 (2.1)	-0.9 [-1.4 to -0.4]	+0.4 [-0.5 to +1.2]	.37	.32
TPAG (n=48)	5.4 (1.4)	5.1 (1.8)	-0.3 [-0.8 to +0.2]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 5. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Behavioral Beliefs in Young Adult Cancer Survivors at One Month Follow-Up, Alberta, Canada, June-November 2012.

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Instrumental Attitude						
Lose/control your weight						
CPAG (n=70)	5.2 (1.4)	5.3 (1.5)	+0.1 [-0.3 to +0.5]	-0.1 [-0.4 to +0.5]	.81	-.07
TPAG (n=72)	5.0 (1.4)	5.1 (1.5)	+0.1 [-0.3 to +0.5]			
Feel fit/healthy						
CPAG (n=70)	6.1 (0.8)	6.0 (1.0)	-0.1 [-0.3 to +0.1]	+0.1 [-0.2 to +0.4]	.46	.13
TPAG (n=72)	6.0 (0.8)	6.2 (1.0)	+0.1 [-0.2 to +0.4]			
Improve energy						
CPAG (n=70)	6.0 (1.0)	5.9 (1.0)	-0.1 [-0.3 to +0.2]	-0.0 [-0.4 to +0.4]	.98	-.00
TPAG (n=72)	6.0 (0.9)	6.0 (1.1)	-0.1 [-0.4 to +0.2]			
Improve endurance						
CPAG (n=70)	6.0 (1.0)	6.1 (0.9)	+0.0 [-0.2 to +0.3]	+0.0 [-0.3 to +0.4]	.80	.00
TPAG (n=72)	6.0 (1.0)	6.1 (0.9)	+0.1 [-0.2 to +0.4]			
Improve strength						
CPAG (n=70)	6.1 (0.9)	6.0 (0.9)	-0.2 [-0.4 to +0.1]	+0.3 [-0.0 to +0.6]	.078	.33
TPAG (n=72)	6.0 (0.9)	6.1 (0.9)	+0.1 [-0.2 to +0.4]			
Have better health						
CPAG (n=70)	6.1 (0.8)	6.1 (1.0)	-0.1 [-0.3 to +0.1]	-0.0 [-0.4 to +0.3]	.81	-.00
TPAG (n=72)	6.1 (0.9)	6.0 (1.1)	-0.1 [-0.4 to +0.2]			
Improve mood						
CPAG (n=70)	6.0 (0.9)	6.0 (1.0)	-0.1 [-0.3 to +0.1]	+0.0 [-0.3 to +0.4]	.85	.00
TPAG (n=72)	5.8 (0.9)	5.9 (1.0)	+0.1 [-0.2 to +0.4]			
Feel better						
CPAG (n=70)	6.1 (0.9)	6.0 (1.0)	-0.1 [-0.3 to +0.1]	-0.0 [-0.4 to +0.3]	.90	-.00
TPAG (n=72)	6.0 (0.9)	6.0 (1.0)	+0.1 [-0.2 to +0.4]			
Reduce stress						
CPAG (n=70)	5.9 (1.0)	5.8 (1.2)	-0.2 [-0.4 to +0.1]	+0.2 [-0.2 to +0.6]	.25	.20

TPAG (n=72)	5.8 (1.1)	5.8 (1.1)	+0.1 [-0.2 to +0.4]			
Better sleep						
CPAG (n=70)	5.5 (1.4)	5.5 (1.3)	-0.1 [-0.3 to +0.2]	+0.1 [-0.3 to +0.5]	.62	.08
TPAG	5.7 (1.2)	5.8 (1.2)	+0.1 [-0.2 to +0.4]			
Reduce risk of cancer coming back						
CPAG (n=70)	5.1 (1.6)	4.9 (1.5)	-0.1 [-0.3 to +0.4]	-0.0 [-0.4 to +0.4]	.98	-.00
TPAG (n=72)	5.2 (1.3)	5.1 (1.3)	-0.2 [-0.2 to +0.5]			
Reduce chance of other chronic disease						
CPAG (n=70)	5.5 (1.2)	5.6 (1.1)	+0.0 [-0.2 to +0.3]	-0.1 [-0.5 to +0.2]	.52	-.09
TPAG (n=72)	5.5 (1.0)	5.5 (1.3)	-0.1 [-0.4 to +0.2]			
Live longer						
CPAG (n=70)	5.8 (1.1)	5.7 (1.1)	-0.1 [-0.4 to +0.1]	+0.0 [-0.3 to +0.4]	.94	.00
TPAG (n=72)	5.5 (1.2)	5.5 (1.2)	+0.0 [-0.3 to +0.3]			
Affective Attitude						
Exercise with other people						
CPAG (n=70)	4.0 (2.0)	4.4 (1.9)	+0.3 [-0.2 to +0.7]	-0.1 [-0.6 to +0.4]	.70	-.06
TPAG (n=72)	4.6 (1.6)	4.7 (1.6)	+0.1 [-0.3 to +0.5]			
Listening to music while exercising						
CPAG (n=70)	5.6 (1.8)	5.3 (1.7)	-0.3 [-0.6 to -0.0]	+0.2 [-0.2 to +0.7]	.30	.12
TPAG (n=72)	5.6 (1.5)	5.5 (1.7)	-0.0 [-0.4 to +0.3]			
Do a variety of activities						
CPAG (n=70)	5.5 (1.3)	5.3 (1.1)	-0.2 [-0.5 to +0.1]	+0.2 [-0.2 to +0.5]	.33	.15
TPAG (n=72)	5.3 (1.3)	5.5 (1.1)	+0.1 [-0.2 to +0.4]			
See improvements from exercising						
CPAG (n=70)	5.9 (0.9)	5.7 (1.0)	-0.2 [-0.4 to +0.0]	+0.2 [-0.1 to +0.5]	.27	.22
TPAG (n=72)	5.8 (0.9)	5.8 (0.9)	+0.0 [-0.3 to +0.3]			
Socialize/meet new people while exercising						
CPAG (n=70)	3.6 (1.8)	3.8 (1.9)	+0.2 [-0.2 to +0.6]	-0.2 [-0.7 to +0.4]	.38	-.12

TPAG (n=72)	3.8 (1.7)	3.8 (1.8)	-0.0 [-0.5 to +0.4]			
Exercise in a group						
CPAG (n=70)	3.4 (1.9)	3.2 (1.9)	-0.2 [-0.7 to +0.2]	+0.5 [-0.1 to +1.0]	.10	.28
TPAG (n=72)	3.5 (1.8)	3.8 (1.9)	+0.3 [-0.1 to +0.6]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 6. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Control Beliefs in Young Adult Cancer Survivors at One Month Follow-Up, Alberta, Canada, June-November 2012.

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Perceived Behavioral Control						
You were busy/had limited time						
CPAG (n=70)	4.2 (1.6)	4.1 (1.6)	-0.1 [-0.4 to +0.2]	-0.1 [-0.5 to +0.4]	.83	-.06
TPAG (n=72)	4.3 (1.6)	4.1 (1.5)	-0.2 [-0.7 to +0.2]			
You had family responsibilities						
CPAG (n=70)	4.4 (1.5)	4.5 (1.5)	+0.0 [-0.3 to +0.4]	-0.3 [-0.7 to +0.2]	.21	-.19
TPAG (n=72)	4.4 (1.6)	4.2 (1.5)	-0.2 [-0.5 to +0.2]			
You had work responsibilities						
CPAG (n=70)	4.3 (1.5)	4.5 (1.6)	+0.1 [-0.3 to +0.5]	-0.3 [-0.8 to +0.2]	.18	-.19
TPAG (n=72)	4.4 (1.6)	4.2 (1.6)	-0.2 [-0.6 to +0.2]			
You had no motivation						
CPAG (n=70)	3.8 (1.7)	3.8 (1.6)	+0.0 [-0.3 to +0.4]	-0.1 [-0.6 to +0.4]	.64	-.06
TPAG (n=72)	3.5 (1.7)	3.5 (1.7)	+0.1 [-0.2 to +0.4]			
You were tired						
CPAG (n=70)	3.6 (1.6)	3.7 (1.5)	+0.1 [-0.2 to +0.4]	-0.1 [-0.5 to +0.4]	.76	-.06
TPAG (n=72)	3.5 (1.5)	3.6 (1.6)	+0.1 [-0.2 to +0.5]			
The weather was bad						
CPAG (n=70)	4.4 (1.6)	4.4 (1.6)	-0.1 [-0.5 to +0.3]	-0.1 [-0.6 to +0.5]	.84	-.06
TPAG (n=72)	4.3 (1.6)	4.3 (1.7)	+0.0 [-0.4 to +0.4]			
You had limited or no access to recreation facility/gym						
CPAG (n=70)	4.7 (1.6)	4.4 (1.7)	-0.2 [-0.6 to +0.2]	+0.3 [-0.2 to +0.9]	.22	.18
TPAG (n=72)	4.5 (1.8)	4.6 (1.9)	+0.1 [-0.3 to +0.5]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 7. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Normative Beliefs in Young Adult Cancer Survivors at One Month Follow-Up, Alberta, Canada, June-November 2012.

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Injunctive Norm						
Friends						
CPAG (n=67)	5.7 (1.3)	5.6 (1.3)	-0.2 [-0.5 to +0.2]	-0.1 [-0.5 to +0.2]	.44	-.08
TPAG (n=68)	5.7 (1.1)	5.5 (1.2)	-0.1 [-0.4 to +0.1]			
Spouse/partner						
CPAG (n=60)	6.1 (1.3)	5.9 (1.3)	-0.1 [-0.4 to +0.2]	-0.2 [-0.4 to 0.2]	.45	-.08
TPAG (n=59)	6.2 (1.1)	6.2 (1.2)	-0.1 [-0.5 to +0.1]			
Family						
CPAG (n=64)	5.8 (1.3)	5.8 (1.3)	+0.0 [-0.3 to +0.3]	-0.1 [-0.5 to +0.2]	.48	-.08
TPAG (n=68)	5.6 (1.0)	5.8 (1.1)	+0.1 [-0.4 to +0.1]			
Children						
CPAG (n=49)	5.6 (1.2)	5.6 (1.4)	-0.1 [-0.5 to +0.4]	-0.2 [-0.8 to +0.4]	.51	-.16
TPAG (n=40)	5.2 (1.3)	5.2 (1.5)	-0.1 [-0.4 to +0.3]			
Co-workers						
CPAG (n=59)	5.4 (1.3)	5.1 (1.1)	-0.2 [-0.5 to +0.2]	-0.1 [-0.5 to +0.3]	.54	-.08
TPAG (n=58)	5.1 (1.1)	5.3 (1.3)	+0.1 [-0.3 to +0.2]			
Parents						
CPAG (n=64)	5.9 (1.2)	5.6 (1.3)	-0.3 [-0.5 to -0.1]	+0.1 [-0.3 to +0.4]	.80	.09
TPAG (n=68)	5.8 (1.1)	5.7 (1.2)	-0.2 [-0.4 to +0.1]			
Descriptive Norms						
Friends						
CPAG (n=67)	4.7 (1.8)	4.9 (1.6)	+0.2 [-0.2 to +0.5]	+0.0 [-0.4 to +0.4]	.90	.00
TPAG (n=69)	5.1 (1.5)	5.2 (1.3)	+0.1 [-0.2 to +0.4]			
Spouse/partner						
CPAG (n=61)	5.1 (2.1)	5.0 (1.8)	-0.2 [-0.6 to +0.3]	+0.4 [-0.2 to +0.9]	.16	.22
TPAG (n=59)	5.1 (1.8)	5.4 (1.8)	+0.2 [-0.2 to +0.5]			
Children						

CPAG (n=49)	5.0 (1.7)	5.3 (1.6)	+0.1 [0.4 to +0.7]	-0.0 [-0.8 to +0.7]	.96	-.00
TPAG (n=39)	5.6 (1.3)	5.2 (1.6)	-0.3 [-0.8 to +0.3]			
Family						
CPAG (n=65)	4.5 (1.6)	4.6 (1.6)	+0.2 [-0.1 to +0.6]	-0.3 [-0.8 to +0.2]	.27	-.21
TPAG (n=64)	4.7 (1.3)	4.5 (1.4)	-0.2 [-0.7 to +0.2]			
Coworkers						
CPAG (n=53)	4.1 (1.9)	4.4 (1.5)	+0.2 [-0.2 to +0.7]	+0.0 [-0.4 to +0.5]	.89	.00
TPAG (n=57)	4.6 (1.4)	4.6 (1.3)	+0.1 [-0.3 to +0.4]			
Parents						
CPAG (n=59)	4.1 (1.8)	4.1 (1.9)	+0.1 [-0.3 to +0.5]	+0.1 [-0.5 to +0.6]	.74	.06
TPAG (n=64)	3.9 (1.9)	4.3 (1.8)	+0.3 [-0.1 to +0.6]			
Siblings						
CPAG (n=59)	4.5 (1.8)	4.4 (1.8)	-0.0 [-0.5 to +0.4]	-0.1 [-0.6 to +0.5]	.83	-.06
TPAG (n= 64)	4.5 (1.6)	4.5 (1.6)	+0.1 [-0.3 to +0.4]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 8. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Behavioral Beliefs in Young Adult Cancer Survivors at Three Month Follow-Up, Alberta, Canada, June-November 2012.

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Instrumental Attitude						
Lose/control your weight						
CPAG (n=63)	5.2 (1.5)	5.6 (1.5)	+0.4 [-0.0 to +0.7]	-0.3 [-0.8 to +0.2]	.22	-.21
TPAG (n=65)	5.3 (1.3)	5.3 (1.5)	+0.1 [-0.3 to +0.4]			
Feel fit/healthy						
CPAG (n=63)	6.1 (0.9)	6.1 (1.1)	+0.0 [-0.2 to +0.3]	+0.0 [-0.3 to +0.3]	.84	.00
TPAG (n=65)	6.2 (0.7)	6.3 (0.7)	+0.1 [-0.1 to +0.3]			
Improve energy						
CPAG (n=63)	6.0 (1.0)	6.1 (1.0)	+0.1 [-0.2 to +0.4]	-0.1 [-0.4 to +0.2]	.60	-.10
TPAG (n=65)	6.0 (0.9)	6.1 (0.9)	+0.2 [-0.0 to +0.4]			
Improve endurance						
CPAG (n=63)	6.1 (1.1)	6.2 (1.0)	+0.1 [-0.2 to +0.4]	-0.1 [-0.3 to 0.2]	.74	-.11
TPAG (n=65)	6.1 (0.8)	6.2 (0.8)	+0.1 [-0.1 to +0.3]			
Improve strength						
CPAG (n=63)	6.1 (0.9)	6.1 (1.0)	+0.0 [-0.2 to +0.3]	+0.1 [-0.2 to +0.4]	.55	.11
TPAG (n=65)	6.1 (0.8)	6.3 (0.8)	+0.2 [-0.0 to +0.4]			
Have better health						
CPAG (n=63)	6.2 (0.8)	6.2 (1.0)	-0.0 [-0.2 to +0.2]	-0.0 [-0.3 to +0.2]	.81	-.00
TPAG (n=65)	6.1 (0.8)	6.1 (0.8)	+0.1 [-0.2 to +0.3]			
Improve mood						
CPAG (n=63)	6.1 (0.8)	5.9 (1.0)	-0.2 [-0.4 to +0.0]	+0.2 [-0.1 to +0.5]	.31	.25
TPAG (n=65)	5.9 (0.8)	6.0 (0.8)	+0.2 [-0.1 to +0.4]			
Feel better						
CPAG (n=63)	6.2 (0.8)	6.1 (1.0)	-0.1 [-0.3 to +0.1]	-0.0 [-0.3 to +0.2]	.77	-.00
TPAG (n=65)	6.0 (0.9)	6.0 (0.8)	-0.1 [-0.4 to +0.2]			
Reduce stress						
CPAG (n=63)	6.0 (1.0)	5.9 (1.2)	-0.2 [-0.5 to +0.1]	-0.0 [-0.4 to +0.3]	.83	-.00
TPAG (n=65)	5.8 (1.0)	5.9 (1.1)	+0.1 [-0.4 to +0.2]			

Better sleep						
CPAG (n=63)	5.6 (1.5)	5.7 (1.2)	+0.1 [-0.2 to +0.3]	-0.1 [-0.4 to +0.3]	.66	-.07
TPAG (n=65)	5.8 (1.1)	6.0 (1.1)	+0.1 [-0.2 to +0.4]			
Reduce risk of cancer coming back						
CPAG (n=63)	5.1 (1.6)	5.1 (1.7)	+0.1 [-0.3 to +0.4]	+0.1 [-0.4 to +0.5]	.82	.06
TPAG (n=65)	4.8 (1.6)	5.2 (1.4)	+0.3 [-0.0 to +0.7]			
Reduce chance of other chronic disease						
CPAG (n=63)	5.5 (1.3)	5.6 (1.3)	+0.1 [-0.1 to +0.3]	-0.3 [-0.7 to +0.0]	.072	-.23
TPAG (n=65)	5.5 (1.0)	5.4 (1.4)	-0.1 [-0.4 to +0.2]			
Live longer						
CPAG (n=63)	5.8 (1.1)	5.5 (1.4)	-0.3 [-0.6 to +0.1]	+0.2 [-0.3 to +0.6]	.40	.15
TPAG (n=65)	5.5 (1.1)	5.6 (1.3)	+0.1 [-0.2 to +0.4]			
Affective Attitude						
Exercise with other people						
CPAG (n=63)	4.1 (1.9)	4.1 (2.0)	+0.1 [-0.5 to +0.6]	+0.2 [-0.4 to +0.9]	.48	.11
TPAG (n=65)	4.7 (1.5)	4.7 (1.6)	+0.1 [-0.5 to +0.6]			
Listening to music while exercising						
CPAG (n=63)	5.7 (1.8)	5.3 (1.8)	-0.4 [-0.8 to -0.1]	+0.3 [-0.2 to +0.8]	.25	.18
TPAG (n=65)	5.6 (1.5)	5.6 (1.4)	+0.1 [-0.3 to +0.5]			
Do a variety of activities						
CPAG (n=63)	5.4 (1.3)	5.2 (1.3)	-0.2 [-0.6 to +0.2]	+0.1 [-0.3 to +0.6]	.56	.08
TPAG (n=65)	5.4 (1.3)	5.4 (1.4)	-0.1 [-0.4 to +0.3]			
See improvements from exercising						
CPAG (n=63)	5.9 (0.9)	5.8 (1.1)	-0.1 [-0.3 to +0.2]	-0.0 [-0.4 to +0.3]	.87	-.00
TPAG (n=65)	5.9 (0.9)	5.9 (1.4)	+0.0 [-0.3 to +0.3]			
Socialize/meet new people while exercising						
CPAG (n=63)	3.5 (1.7)	3.6 (1.9)	+0.2 [-0.2 to +0.6]	+0.2 [-0.4 to +0.9]	.46	.11
TPAG (n=65)	4.0 (1.6)	4.2 (1.7)	+0.3 [-0.7 to +0.1]			

Exercise in a group						
CPAG (n=63)	3.3 (1.9)	3.3 (2.0)	+0.0 [-0.4 to +0.5]	+0.5 [-0.1 to +1.1]	.12	.26
TPAG (n=65)	3.5 (1.7)	4.0 (1.7)	+0.5 [+0.0 to +0.9]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 9. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Control Beliefs in Young Adult Cancer Survivors at Three Month Follow-Up, Alberta, Canada, June-November 2012.

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Perceived Behavioral Control						
You were busy/had limited time						
CPAG (n=63)	4.2 (2.0)	4.0 (2.1)	-0.2 [-0.6 to +0.2]	+0.1 [-0.5 to +0.7]	.82	.04
TPAG (n=65)	4.4 (1.6)	4.2 (1.8)	-0.1 [-0.6 to +0.3]			
You had family responsibilities						
CPAG (n=63)	4.3 (1.5)	4.1 (2.0)	-0.2 [-0.7 to +0.2]	-0.2 [-0.8 to +0.5]	.58	-.13
TPAG (n=65)	4.4 (1.5)	4.2 (1.9)	-0.3 [-0.7 to +0.1]			
You had work responsibilities						
CPAG (n=63)	4.2 (1.6)	4.0 (2.0)	-0.2 [-0.7 to +0.2]	+0.1 [-0.6 to +0.8]	.74	.15
TPAG (n=65)	4.4 (1.6)	4.3 (1.9)	-0.2 [-0.7 to +0.3]			
You had no motivation						
CPAG (n=63)	3.7 (1.7)	3.8 (2.1)	+0.2 [-0.3 to +0.6]	-0.0 [-0.7 to +0.6]	.90	-.00
TPAG (n=65)	3.5 (1.8)	3.7 (2.0)	+0.2 [-0.3 to +0.6]			
You were tired						
CPAG (n=63)	3.5 (1.6)	3.7 (2.0)	+0.2 [-0.2 to +0.6]	+0.1 [-0.5 to +0.6]	.79	.06
TPAG (n=65)	3.5 (1.6)	3.8 (1.7)	+0.3 [-0.1 to +0.6]			
The weather was bad						
CPAG (n=63)	4.5 (1.6)	4.4 (1.8)	-0.1 [-0.6 to +0.3]	+0.3 [-0.3 to +0.9]	.33	.20
TPAG (n=65)	4.2 (1.6)	4.4 (1.9)	+0.2 [-0.2 to +0.7]			
You had limited or no access to recreation facility/gym						
CPAG (n=63)	4.5 (1.6)	4.2 (1.8)	-0.4 [-0.9 to +0.0]	+0.2 [-0.5 to +0.8]	.62	.10
TPAG (n=65)	4.2 (2.1)	4.5 (1.8)	-0.3 [-0.8 to +0.1]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 10. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Normative Beliefs in Young Adult Cancer Survivors at Three Month Follow-Up, Alberta, Canada, June-November 2012.

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Injunctive Norm						
Friends						
CPAG (n=62)	5.8 (1.2)	5.7 (1.3)	-0.0 [-0.4 to +0.3]	-0.3 [-0.8 to +0.1]	.16	-.21
TPAG (n=62)	5.9 (1.1)	5.4 (1.5)	-0.4 [-0.7 to -0.1]			
Spouse/partner						
CPAG (n=56)	6.0 (1.3)	5.7 (1.6)	-0.4 [-0.7 to -0.1]	-0.3 [-0.7 to +0.2]	.27	-.28
TPAG (n=53)	6.4 (0.8)	5.8 (1.3)	-0.5 [-0.8 to -0.2]			
Family members						
CPAG (n=59)	5.9 (1.2)	5.7 (1.4)	-0.2 [-0.4 to +0.1]	-0.2 [-0.7 to +0.2]	.28	-.17
TPAG (n=64)	5.9 (1.0)	5.6 (1.3)	-0.4 [-0.7 to -0.1]			
Children						
CPAG (n=44)	5.6 (1.2)	5.2 (1.3)	-0.4 [-0.7 to -0.0]	+0.1 [-0.4 to +0.7]	.64	.08
TPAG (n=43)	5.3 (1.2)	5.1 (1.5)	-0.1 [-0.6 to +0.4]			
Co-workers						
CPAG (n=56)	5.5 (1.2)	5.3 (1.4)	-0.3 [-0.7 to +0.1]	+0.1 [-0.5 to +0.6]	.26	.09
TPAG (n=60)	5.3 (1.1)	5.2 (1.3)	-0.2 [-0.5 to +0.1]			
Parents						
CPAG (n=56)	6.0 (1.2)	5.6 (1.3)	-0.3 [-0.6 to -0.0]	-0.2 [-0.6 to +0.3]	.45	.18
TPAG (n=62)	5.9 (1.1)	5.5 (1.3)	-0.4 [-0.7 to -0.1]			
Descriptive Norms						
Friends						
CPAG (n=62)	4.7 (1.9)	5.0 (1.5)	+0.3 [-0.1 to +0.8]	+0.0 [-0.5 to +0.5]	.95	.00
TPAG (n=65)	5.2 (1.4)	5.1 (1.3)	-0.0 [-0.4 to +0.3]			
Spouse/partner						
CPAG (n= 56)	5.0 (2.1)	5.1 (1.8)	+0.1 [-0.4 to +0.5]	-0.0 [-0.6 to +0.6]	.94	-.00
TPAG (n=55)	5.3 (1.7)	5.3 (1.6)	+0.0 [-0.4 to +0.4]			
Children						

CPAG (n=44)	5.0 (1.7)	5.3 (1.4)	+0.3 [-0.2 to +0.7]	-0.1 [-0.7 to +0.4]	.60	-.06
TPAG (n=40)	5.4 (1.6)	5.5 (1.4)	+0.0 [-0.3 to +0.3]			
Family						
CPAG (n=57)	4.4 (1.8)	4.6 (1.8)	+0.1 [-0.4 to +0.6]	+0.0 [-0.6 to +0.6]	.98	.00
TPAG (n=61)	4.8 (1.4)	4.7 (1.4)	-0.1 [-0.5 to +0.3]			
Coworkers						
CPAG (n=53)	4.3 (1.9)	4.5 (1.7)	+0.1 [-0.5 to +0.7]	+0.3 [-0.3 to +0.9]	.31	.17
TPAG (n=52)	4.5 (1.5)	4.8 (1.4)	+0.2 [-0.2 to +0.6]			
Parents						
CPAG (n=56)	4.0 (1.8)	4.3 (1.8)	+0.3 [-0.2 to +0.8]	-0.2 [-0.8 to +0.4]	.50	-.12
TPAG (n=57)	4.0 (1.8)	4.2 (1.7)	+0.1 [-0.4 to +0.5]			
Siblings						
CPAG (n=58)	4.5 (1.9)	4.5 (1.9)	+0.0 [-0.4 to +0.4]	+0.3 [-0.2 to +0.8]	.28	.18
TPAG (n=60)	4.5 (1.6)	4.8 (1.4)	+0.4 [-0.0 to +0.7]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 11. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Behavioral Beliefs at One Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November 2012

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Instrumental Attitude						
Lose/control your weight						
CPAG (n=53)	5.2 (1.4)	5.3 (1.5)	+0.2 [-0.3 to +0.5]	+0.1 [-0.4 to +0.7]	.60	.07
TPAG (n=55)	5.1 (1.5)	5.3 (1.3)	+0.3 [-0.1 to +0.6]			
Feel fit/healthy						
CPAG (n=53)	6.0 (0.8)	6.0 (1.0)	-0.0 [-0.2 to +0.2]	+0.0 [-0.3 to +0.4]	.83	.00
TPAG (n=55)	6.1 (0.8)	6.1 (1.1)	+0.1 [-0.2 to +0.4]			
Improve energy						
CPAG (n=53)	5.9 (1.0)	6.1 (0.8)	+0.1 [-0.2 to +0.4]	-0.0 [-0.4 to +0.3]	.92	-.00
TPAG (n=55)	6.0 (1.0)	6.1 (0.9)	+0.0 [-0.3 to +0.3]			
Improve endurance						
CPAG (n=53)	6.1 (1.0)	6.2 (0.8)	+0.1 [-0.2 to +0.3]	+0.1 [-0.3 to +0.4]	.69	.09
TPAG (n=55)	6.0 (1.0)	6.1 (1.0)	+0.1 [-0.3 to +0.5]			
Improve strength						
CPAG (n=53)	6.1 (0.9)	6.0 (1.0)	-0.1 [-0.4 to +0.1]	+0.3 [-0.1 to +0.7]	.11	.32
TPAG (n=55)	6.0 (0.9)	6.2 (0.9)	+0.2 [-0.2 to +0.5]			
Have better health						
CPAG (n=53)	6.1 (0.8)	6.1 (0.9)	-0.0 [-0.2 to +0.2]	-0.1 [-0.5 to +0.3]	.71	-.13
TPAG (n=55)	6.2 (0.9)	6.1 (1.1)	-0.1 [-0.5 to +0.3]			
CPAG (n=53)	6.1 (0.8)	6.1 (0.8)	-0.0 [-0.2 to +0.2]	+0.1 [-0.3 to +0.4]	.63	.11
Improve mood						
TPAG (n=55)	5.8 (1.0)	6.0 (0.9)	+0.2 [-0.2 to +0.5]			
Feel better						
CPAG (n=53)	6.1 (0.9)	6.1 (0.9)	+0.0 [-0.2 to +0.2]	-0.0 [-0.4 to 0.3]	.34	-.00
TPAG (n=55)	6.0 (1.0)	6.1 (0.9)	+0.1 [-0.3 to +0.5]			

Reduce stress						
CPAG (n=53)	5.9 (0.8)	5.8 (1.0)	-0.1 [-0.4 to +0.1]	+0.1 [-0.3 to +0.5]	.57	.10
TPAG (n=55)	5.8 (1.1)	5.8 (1.1)	+0.1 [-0.3 to +0.4]			
Better sleep						
CPAG (n=53)	5.7 (1.1)	5.5 (1.4)	-0.1 [-0.4 to +0.2]	+0.2 [-0.3 to +0.6]	.47	.18
TPAG (n=55)	5.7 (1.2)	5.8 (1.2)	+0.0 [-0.3 to 0.4]			
Reduce risk of cancer coming back						
CPAG (n=53)	5.0 (1.5)	5.0 (1.4)	+0.0 [-0.3 to +0.3]	+0.1 [-0.3 to +0.6]	.60	.08
TPAG (n=55)	4.9 (1.4)	5.1 (1.3)	+0.2 [-0.2 to +0.6]			
Reduce chance of other chronic disease						
CPAG (n=53)	5.4 (1.2)	5.5 (1.2)	+0.1 [-0.2 to +0.4]	-0.1 [-0.5 to +0.4]	.77	-.09
TPAG (n=55)	5.5 (1.1)	5.4 (1.3)	-0.1 [-0.5 to +0.2]			
Live longer						
CPAG (n=53)	5.7 (1.1)	5.6 (1.0)	-0.2 [-0.5 to +0.1]	+0.1 [-0.3 to +0.5]	.58	.09
TPAG (n=55)	5.4 (1.2)	5.5 (1.2)	+0.1 [-0.3 to +0.4]			
Affective Attitude						
Exercise with other people						
CPAG (n=53)	3.8 (1.9)	4.1 (2.0)	+0.2 [-0.3 to +0.7]	+0.1 [-0.6 to +0.7]	.84	.05
TPAG (n=55)	4.3 (1.7)	4.6 (1.7)	+0.3 [-0.2 to +0.8]			
Listening to music while exercising		CPAG (n=53)	5.6 (1.8)	5.1 (1.7)	-0.4 [-0.8 to -0.1]	
		+0.4 [-0.2 to +0.9]	.17	.23		
TPAG (n=55)	5.7 (1.5)	5.5 (1.6)	-0.1 [-0.4 to +0.2]			
Do a variety of activities						
CPAG (n=53)	5.3 (1.3)	5.1 (1.7)	-0.1 [-0.5 to +0.2]	+0.3 [-0.2 to +0.7]	.21	.25
TPAG (n=55)	5.1 (1.3)	5.4 (1.2)	+0.2 [-0.1 to +0.6]			
See improvements from exercising						
CPAG (n=53)	5.8 (0.8)	5.6 (1.0)	-0.2 [-0.4 to +0.1]	+0.3 [-0.1 to +0.7]	.088	.37
TPAG (n=55)	5.8 (0.9)	5.9 (0.9)	+0.1 [-0.3 to +0.5]			
Socialize/meet new people while exercising						

CPAG (n=53)	3.2 (1.6)	3.5 (1.9)	+0.3 [-0.1 to +0.7]	+0.0 [-0.7 to +0.7]	.98	.00
TPAG (n=55)	3.7 (1.7)	3.8 (1.9)	+0.1 [-0.4 to +0.6]			
Exercise in a group						
CPAG (n=53)	3.0 (1.8)	2.9 (1.8)	-0.1 [-0.6 to +0.4]	+0.4 [-0.2 to +1.1]	.17	.22
TPAG (n=55)	3.2 (1.8)	3.5 (1.8)	+0.2 [-0.2 to +0.7]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 12. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Control Beliefs at One Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November 2012

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Perceived Behavioral Control						
You were busy/had limited time						
CPAG (n=53)	3.9 (1.5)	3.9 (1.6)	-0.3 [-0.4 to +0.3]	+0.2 [-0.4 to +0.7]	.57	.13
TPAG (n=55)	4.3 (1.6)	4.1 (1.5)	-0.2 [-0.6 to +0.2]			
You had family responsibilities						
CPAG (n=53)	4.1 (1.5)	4.2 (1.4)	+0.1 [-0.3 to +0.5]	-0.1 [-0.7 to +0.5]	.73	-.07
TPAG (n=55)	4.2 (1.6)	4.1 (1.6)	-0.2 [-0.5 to +0.2]			
You had work responsibilities						
CPAG (n=53)	4.1 (1.5)	4.2 (1.5)	+0.1 [-0.4 to +0.6]	-0.2 [-0.8 to +0.4]	.42	-.13
TPAG (n=55)	4.4 (1.6)	4.1 (1.6)	-0.3 [-0.7 to +0.2]			
You had no motivation						
CPAG (n=53)	3.5 (1.5)	3.6 (1.5)	+0.0 [-0.4 to +0.4]	+0.2 [-0.4 to +0.8]	.46	.13
TPAG (n=55)	3.3 (1.7)	3.5 (1.7)	+0.3 [-0.1 to +0.7]			
You were tired						
CPAG (n=53)	3.2 (1.4)	3.5 (1.4)	+0.2 [-0.2 to +0.6]	+0.0 [-0.5 to +0.6]	.92	.00
TPAG (n=55)	3.5 (1.6)	3.5 (1.6)	+0.2 [-0.3 to +0.6]			
The weather was bad						
CPAG (n=53)	4.2 (1.4)	4.2 (1.6)	-0.1 [-0.6 to +0.4]	+0.2 [-0.4 to +0.8]	.55	.13
TPAG (n=55)	4.1 (1.6)	4.3 (1.7)	+0.1 [-0.3 to +0.5]			
You had limited or no access to recreation facility/gym						
CPAG (n=53)	4.7 (1.5)	4.4 (1.8)	-0.4 [-0.8 to +0.1]	+0.6 [-0.3 to +1.3]	.062	.36
TPAG (n=55)	4.5 (1.8)	4.5 (1.8)	+0.1 [-0.4 to +0.6]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 13. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Normative Beliefs at One Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November 2012

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Injunctive Norm						
Friends						
CPAG (n=51)	5.7 (1.2)	5.6 (1.3)	-0.1 [-0.5 to +0.2]	-0.1 [-0.6 to +0.3]	.59	-.09
TPAG (n=51)	5.6 (1.1)	5.5 (1.2)	-0.2 [-0.4 to +0.1]			
Spouse/partner						
CPAG (n=46)	6.2 (1.1)	6.0 (1.3)	-0.2 [-0.6 to +0.1]	-0.1 [-0.6 to +0.3]	.56	-.09
TPAG (n=44)	6.2 (1.1)	6.1 (1.2)	-0.2 [-0.5 to +0.1]			
Family members						
CPAG (n=48)	5.8 (1.2)	5.9 (1.2)	+0.1 [-0.3 to +0.5]	-0.2 [-0.7 to +0.3]	.38	-.18
TPAG (n=51)	5.9 (1.0)	5.8 (1.2)	-0.2 [-0.4 to +0.1]			
Children						
CPAG (n=38)	5.7 (1.1)	5.6 (1.4)	-0.1 [-0.6 to +0.3]	-0.1 [-0.9 to +0.6]	.74	-.08
TPAG (n=31)	5.3 (1.3)	5.2 (1.5)	-0.1 [-0.5 to +0.4]			
Co-workers						
CPAG (n=43)	5.4 (1.1)	5.3 (1.3)	-0.2 [-0.6 to +0.3]	-0.2 [-0.8 to +0.3]	.39	-.17
TPAG (n=42)	5.2 (1.1)	5.2 (1.2)	-0.0 [-0.3 to +0.3]			
Parents						
CPAG (n=48)	6.0 (1.1)	5.6 (1.3)	-0.3 [-0.7 to -0.0]	+0.4 [-0.4 to +0.5]	.87	.36
TPAG (n=51)	5.8 (1.1)	5.6 (1.3)	-0.3 [-0.6 to +0.1]			
Descriptive Norms						
Friends						
CPAG (n=51)	4.6 (1.8)	4.8 (1.5)	+0.3 [-0.1 to +0.7]	+0.0 [-0.5 to +0.5]	.99	.00
TPAG (n=52)	5.1 (1.6)	5.0 (1.4)	-0.0 [-0.4 to +0.3]			
Spouse/partner						
CPAG (n=46)	5.2 (1.9)	4.9 (1.7)	-0.2 [-0.7 to +0.3]	+0.6 [-0.2 to +1.3]	.17	.33

TPAG (n=44)	5.0 (1.8)	5.4 (1.7)	+0.3 [-0.5 to +0.1]			
Children						
CPAG (n=38)	5.1 (1.6)	5.3 (1.7)	+0.2 [-0.5 to +0.9]	+0.3 [-0.7 to +1.2]	.57	.21
TPAG (n=30)	5.8 (1.2)	5.4 (1.6)	-0.3 [-1.1 to +0.4]			
Family						
CPAG (n=49)	4.4 (1.6)	4.6 (1.5)	+0.3 [-0.1 to +0.7]	-0.2 [-0.8 to +0.4]	.57	-.13
TPAG (n=49)	4.8 (1.4)	4.5 (1.4)	-0.3 [-0.9 to +0.2]			
Coworkers						
CPAG (n=37)	3.9 (1.9)	4.3 (1.6)	+0.4 [-0.1 to +1.0]	-0.1 [-0.7 to +0.6]	.81	-.05
TPAG (n=41)	4.5 (1.5)	4.5 (1.4)	+0.1 [-0.3 to +0.5]			
Parents						
CPAG (n=44)	4.0 (1.7)	4.1 (1.9)	+0.2 [-0.3 to +0.8]	+0.3 [-0.7 to +0.7]	.94	.17
TPAG (n=48)	4.1 (1.9)	4.2 (1.8)	+0.2 [+0.3 to +0.6]			
Siblings						
CPAG (n=44)	4.2 (1.7)	4.1 (1.8)	+0.1 [-0.5 to +0.6]	+0.1 [-0.6 to +0.8]	.75	.06
TPAG (n=48)	4.5 (1.8)	4.4 (1.6)	+0.1 [-0.4 to +0.5]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 14. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Behavioral Beliefs at Three Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November 2012

	Baseline M (SD)	Three Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Instrumental Attitude						
Lose/control your weight						
CPAG (n=48)	5.1 (1.5)	5.6 (1.4)	+0.4 [+0.2 to +0.9]	-0.3 [-0.8 to +0.3]	.37	.21
TPAG (n=48)	5.4 (1.3)	5.4 (1.4)	-0.0 [-0.4 to +0.4]			
Feel fit/healthy						
CPAG (n=48)	6.1 (0.8)	6.1 (1.1)	-0.0 [-0.3 to +0.2]	+0.1 [-0.3 to +0.5]	.70	.14
TPAG (n=48)	6.2 (0.6)	6.2 (0.7)	+0.0 [-0.2 to +0.2]			
Improve energy						
CPAG(n=48)	6.0 (1.0)	6.1 (1.0)	+0.1 [-0.2 to +0.4]	+0.1 [-0.2 to 0.5]	.52	.11
TPAG (n=48)	6.0 (0.9)	6.1 (0.9)	+0.2 [-0.1 to +0.4]			
Improve endurance						
CPAG (n=48)	6.1 (0.9)	6.1 (1.0)	+0.2 [-0.3 to +0.3]	+0.1 [-0.2 to +0.5]	.95	.12
TPAG (n=48)	6.1 (0.8)	6.2 (0.7)	+0.1 [-0.1 to +0.3]			
Improve strength						
CPAG (n=48)	6.1 (0.9)	6.1 (1.0)	-0.1 [-0.4 to +0.2]	+0.0 [-0.4 to +0.4]	.94	.00
TPAG (n=48)	6.1 (0.7)	6.2 (0.8)	+0.1 [-0.2 to +0.3]			
Have better health						
CPAG (n=48)	6.2 (0.7)	6.1 (0.9)	-0.0 [-0.3 to +0.2]	-0.0 [-0.3 to +0.3]	.97	-.00
TPAG (n=48)	6.1 (0.8)	6.2 (0.8)	+0.0 [-0.2 to +0.2]			
Improve mood						
CPAG (n=48)	6.1 (0.8)	6.0 (0.8)	-0.1 [-0.3 to +0.1]	+0.1 [-0.2 to +0.4]	.54	.13
TPAG (n=48)	5.8 (0.8)	6.1 (0.7)	+0.2 [-0.1 to +0.5]			
Feel Better						
CPAG (n=48)	6.2 (0.7)	6.1 (1.0)	-0.1 [-0.3 to +0.1]	+0.1 [-0.2 to +0.4]	.70	.13
TPAG (n=48)	6.0 (0.9)	6.1 (0.7)	+0.2 [-0.1 to +0.4]			
Reduce stress						
CPAG (n=48)	6.0 (0.8)	6.0 (1.0)	+0.0 [-0.2 to +0.3]	+0.2 [-0.4 to +0.4]	.90	.21

TPAG (n=48)	5.8 (1.0)	6.0 (1.0)	-0.2 [-0.5 to +0.2]			
Better sleep						
CPAG (n=48)	5.9 (1.1)	5.8 (1.0)	-0.0 [-0.3 to +0.2]	-0.0 [-0.4 to +0.3]	.84	-.00
TPAG (n=48)	5.8 (1.0)	5.9 (1.0)	+0.0 [-0.3 to +0.4]			
Reduce risk of cancer coming back						
CPAG (n=48)	4.9 (1.6)	5.0 (1.7)	+0.1 [-0.3 to +0.4]	+0.2 [-0.3 to +0.7]	.43	.13
TPAG (n=48)	4.8 (1.5)	5.3 (1.1)	+0.5 [+0.1 to +0.9]			
Reduce chance of other chronic disease						
CPAG (n=48)	5.4 (1.3)	5.6 (1.3)	+0.2 [-0.5 to +0.1]	-0.3 [-0.6 to +0.2]	.18	-.25
TPAG (n=48)	5.4 (1.1)	5.5 (1.1)	+0.0 [-0.3 to +0.3]			
Live longer						
CPAG (n=48)	5.8 (1.8)	5.6 (1.4)	-0.2 [-0.5 to +0.1]	+0.3 [-0.2 to +0.8]	.24	.19
TPAG (n=48)	5.4 (1.2)	5.6 (1.1)	+0.2 [-0.1 to +0.5]			
Affective Attitude						
Exercise with other people						
CPAG (n=48)	4.0 (1.9)	3.8 (2.0)	-0.2 [-0.8 to +0.4]	+0.6 [-0.2 to +1.4]	.15	.33
TPAG (n=48)	4.4 (1.6)	4.5 (1.7)	+0.1 [-0.5 to +0.7]			
Listening to music while exercising						
CPAG (n=48)	5.6 (1.8)	4.9 (1.9)	-0.7 [-1.1 to -0.3]	+0.5 [-0.1 to +1.1]	.073	.29
TPAG (n=48)	5.6 (1.5)	5.6 (1.4)	-0.0 [-0.5 to +0.4]			
Do a variety of activities						
CPAG(n=48)	5.1 (1.3)	5.0 (1.8)	-0.2 [-0.6 to +0.3]	+0.2 [-0.4 to +0.8]	.43	.15
TPAG (n=48)	5.2 (1.3)	5.2 (1.3)	+0.1 [-0.4 to +0.5]			
See improvements from exercising						
CPAG (n=48)	5.9 (0.8)	5.8 (1.1)	-0.1 [-0.4 to +0.1]	-0.1 [-0.5 to +0.3]	.71	-.13
TPAG (n=48)	5.9 (0.9)	5.8 (1.2)	-0.1 [-0.4 to +0.2]			
Socialize/meet new people while exercising						
CPAG (n=48)	3.2 (1.6)	3.4 (2.0)	+0.2 [-0.3 to +0.7]	+0.4 [-0.4 to +1.2]	.28	.22
TPAG (n=48)	3.9 (1.6)	4.2 (1.8)	+0.3 [-0.3 to 0.9]			

Exercise in a group						
CPAG (n=48)	2.9 (1.8)	2.9 (1.9)	+0.0 [-0.5 to +0.5]	+0.6 [-0.2 to +1.3]	.12	.35
TPAG (n=48)	3.3 (1.7)	3.7 (1.7)	+0.4 [-0.1 to +1.0]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 15. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Control Beliefs at One Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November 2012

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Perceived Behavioral Control						
You were busy/had limited time						
CPAG (n=48)	3.8 (1.4)	3.6 (2.1)	-0.2 [-0.7 to +0.2]	+0.4 [-0.4 to +1.1]	.33	.27
TPAG (n=48)	4.3 (1.6)	4.1 (1.7)	-0.2 [-0.6 to +0.3]			
You had family responsibilities						
CPAG (n=48)	4.1 (1.4)	3.7 (2.0)	-0.4 [0.9 to +0.2]	+0.5 [-0.3 to +1.4]	.21	.33
TPAG (n=48)	4.3 (1.6)	4.0 (1.9)	-0.3 [-0.8 to +0.1]			
You had work responsibilities						
CPAG (n=48)	4.0 (1.5)	3.7 (2.0)	+0.3 [-0.9 to +0.2]	+0.5 [-0.3 to +1.3]	.24	.32
TPAG (n=48)	4.4 (1.6)	4.2 (1.8)	-0.2 [-0.7 to +0.3]			
You had no motivation						
CPAG (n=48)	3.4 (1.6)	3.4 (2.1)	+0.0 [-0.5 to +0.6]	+0.2 [-0.6 to +1.0]	.63	.13
TPAG (n=48)	3.3 (1.7)	3.4 (1.9)	+0.1 [-0.4 to +0.6]			
You were tired						
CPAG (n=48)	3.2 (1.4)	3.3 (1.9)	+0.1 [-0.4 to +0.6]	+0.2 [-0.5 to +0.9]	.61	.13
TPAG (n=48)	3.4 (1.6)	3.5 (1.6)	+0.1 [-0.4 to 0.6]			
The weather was bad						
CPAG (n=48)	4.3 (1.4)	4.1 (1.9)	-0.2 [-0.7 to +0.3]	+0.4 [-0.3 to +1.2]	.26	.25
TPAG (n=48)	4.0 (1.5)	4.2 (1.8)	+0.2 [-0.4 to +0.7]			
You had limited or no access to recreation facility/gym						
CPAG (n=48)	4.6 (1.6)	4.0 (1.9)	-0.6 [-1.2 to -0.1]	+0.6 [-0.1 to +1.4]	.089	.33
TPAG (n=48)	4.4 (1.7)	4.2 (2.0)	-0.3 [-0.8 to +0.2]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

Table 16. Effects of Generic versus Targeted Physical Activity Print Materials on Theory of Planned Behavior Normative Beliefs at One Month Follow-Up in Young Adult Cancer Survivors Reporting ≤ 300 Minutes/Week of Physical Activity at Baseline, Alberta, Canada, June-November 2012

	Baseline M (SD)	One Month M (SD)	Mean change M [95% CI]	[1]Adjusted group difference in mean change: M [95% CI]	p	Cohen's *d*
Injunctive Norm						
Friends						
CPAG (n=47)	5.8 (1.1)	5.6 (1.4)	-0.1 [-0.5 to +0.3]	-0.4 [-1.0 to +0.2]	.23	-.36
TPAG (n=45)	5.8 (1.1)	5.2 (1.6)	-0.6 [-0.9 to -0.7]			
Spouse/partner						
CPAG (n=43)	6.1 (1.1)	5.8 (1.5)	-0.4 [-0.8 to -0.0]	-0.3 [-0.9 to +0.3]	.35	-.29
TPAG (n=38)	6.3 (0.8)	5.7 (1.4)	-0.6 [-0.9 to -0.2]			
Family members						
CPAG (n=42)	5.9 (1.0)	5.7 (1.4)	-0.1 [-0.5 to +0.2]	-0.3 [-0.9 to +0.2]	.23	-.30
TPAG (n=44)	6.0 (0.9)	5.5 (1.4)	-0.5 [-0.9 to -0.1]			
Children						
CPAG (n=33)	5.8 (1.1)	5.2 (1.3)	-0.5 [-0.9 to -0.1]	+0.2 [-0.4 to +0.9]	.49	.18
TPAG (n=26)	5.4 (1.2)	5.2 (1.6)	-0.1 [-0.7 to +0.5]			
Co-workers						
CPAG (n=41)	5.6 (1.0)	5.2 (1.4)	-0.4 [-0.9 to +0.0]	-0.1 [-0.8 to +0.5]	.74	-.09
TPAG (n=37)	5.2 (1.1)	4.8 (1.3)	-0.4 [-0.7 to +0.4]			
Parents						
CPAG (n=41)	6.0 (1.0)	5.7 (1.3))	-0.3 [-0.6 to +0.0]	-0.4 [-0.8 to +0.1]	.17	-.40
TPAG (n=43)	5.8 (1.0)	5.4 (1.3)	-0.5 [-0.8 to -0.1]			
Descriptive Norms						
Friends						
CPAG (n=48)	4.6 (1.8)	4.9 (1.5)	+0.3 [-0.2 to +0.7]	+0.2 [-0.4 to +0.8]	.41	.12
TPAG (n=45)	5.1 (1.5)	5.0 (1.4)	-0.1 [-0.6 to +0.3]			
Spouse/partner						

	CPAG (n=43)	5.1 (1.9)	5.1 (1.6)	+0.1 [-0.5 to +0.7]	+0.3 [-0.5 to +1.0]	.49	.17
	TPAG (n=37)	5.2 (1.7)	5.3 (1.5)	+0.1 [-0.4 to +0.7]			
Children							
	CPAG (n=33)	5.1 (1.6)	5.3 (1.4)	+0.2 [-0.3 to +0.8]	+0.0 [-0.6 to +0.7]	.91	.00
	TPAG (n=26)	5.6 (1.5)	5.6 (1.4)	+0.1 [-0.3 to +0.4]			
Family							
	CPAG (n=44)	4.4 (1.7)	4.5 (1.8)	+0.1 [-0.5 to +0.6]	+0.1 [-0.7 to +0.8]	.86	.06
	TPAG (n=40)	4.8 (1.5)	4.8 (1.4)	-0.1 [-0.6 to +0.3]			
Coworkers							
	CPAG (n=36)	4.2 (1.8)	4.3 (1.5)	+0.2 [-0.5 to +0.9]	+0.2 [-0.6 to +0.9]	.61	.13
	TPAG (n=33)	4.2 (1.4)	4.5 (1.3)	+0.2 [-0.3 to +0.7]			
Parents							
	CPAG (n=40)	4.0 (1.7)	4.4 (1.9)	+0.4 [-0.2 to +1.0]	-0.4 [-1.1 to +0.4]	.30	-.22
	TPAG (n=40)	4.1 (1.8)	4.1 (1.6)	-0.1 [-0.6 to +0.5]			
Siblings							
	CPAG (n=41)	4.2 (1.8)	4.4 (1.8)	+0.1 [-0.3 to +0.5]	+0.3 [-0.3 to +0.9]	.33	.07
	TPAG (n=40)	4.5 (1.8)	4.8 (1.4)	+0.4 [-0.1 to +0.8]			

Note: [1]Adjusted for baseline value of the outcome, education, ethnicity, type of cancer (breast cancer versus other), chemotherapy, radiation therapy, surgery, and months since diagnosis. CPAG=Canada's Physical Activity Guide; TPAG=Targeted Physical Activity Guidebook.

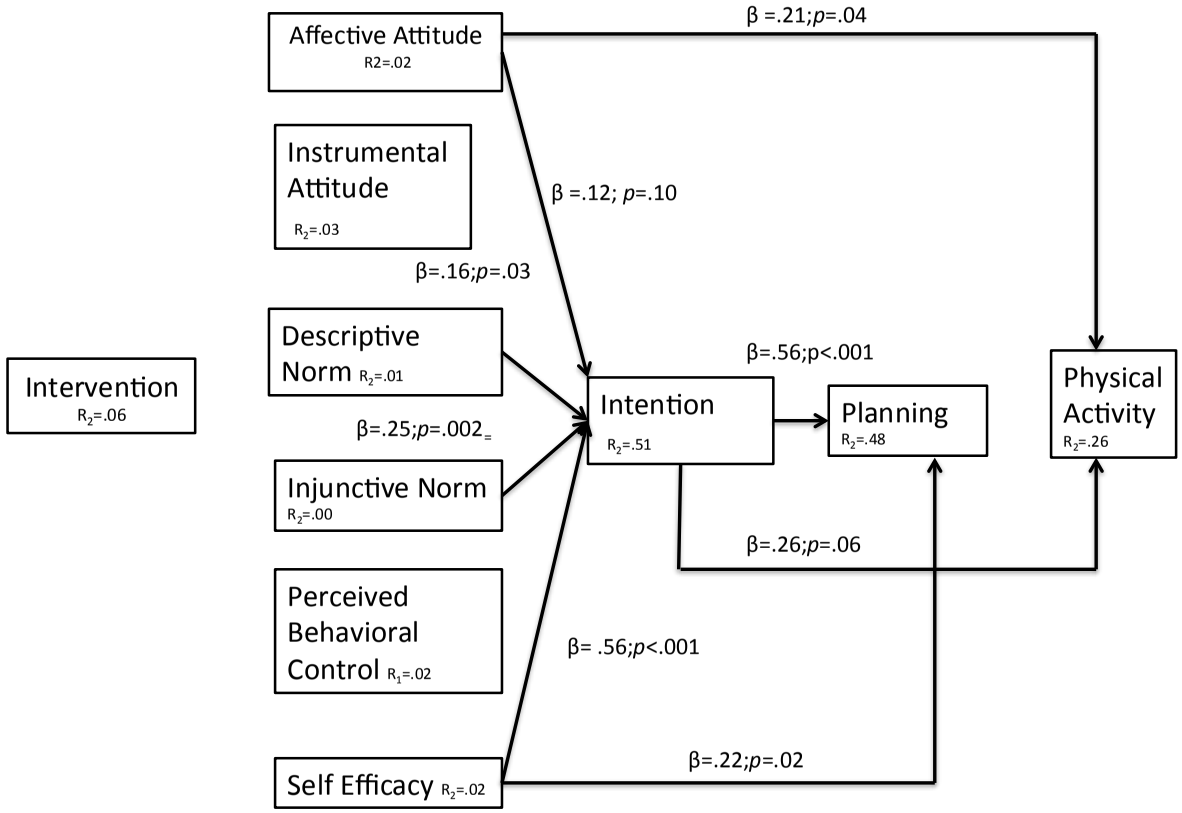

Figure 1. Path analysis of the relationship of physical activity at baseline between group assignment, theory of planned behavior constructs at 1 month and physical activity behavior at 3 months

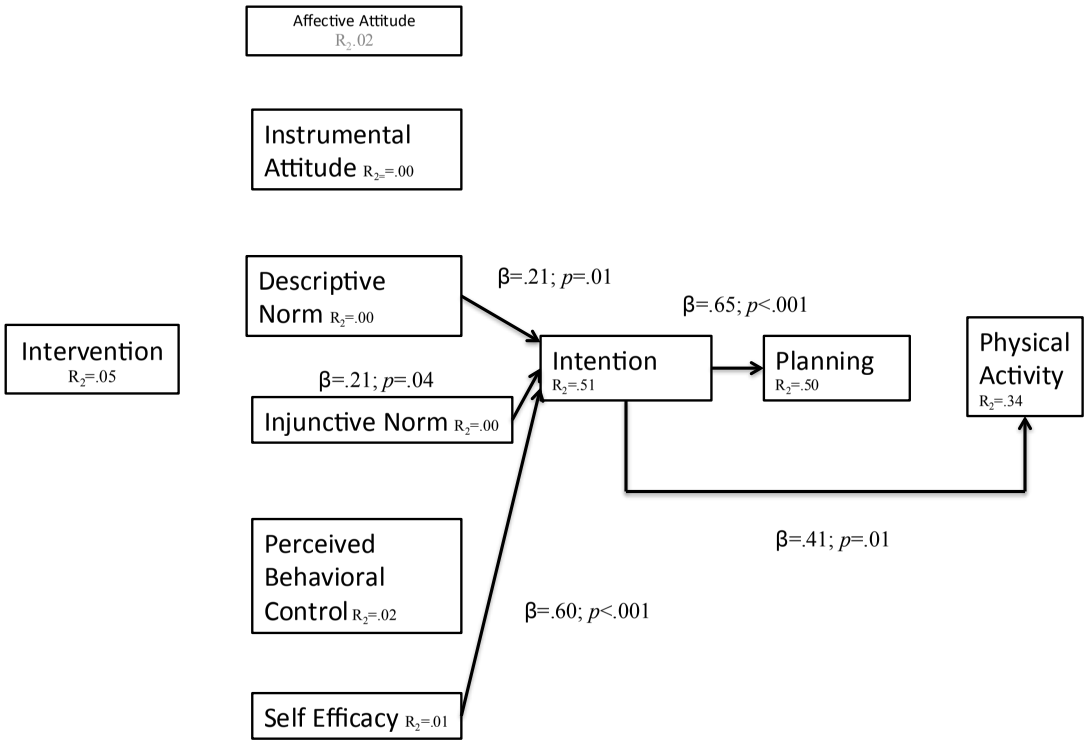

Figure 2. Path analysis of the relationship for participants reporting ≤300 minutes/week of physical activity at baseline between group assignment, theory of planned behavior constructs at 1 month and physical activity behavior at 3 months.

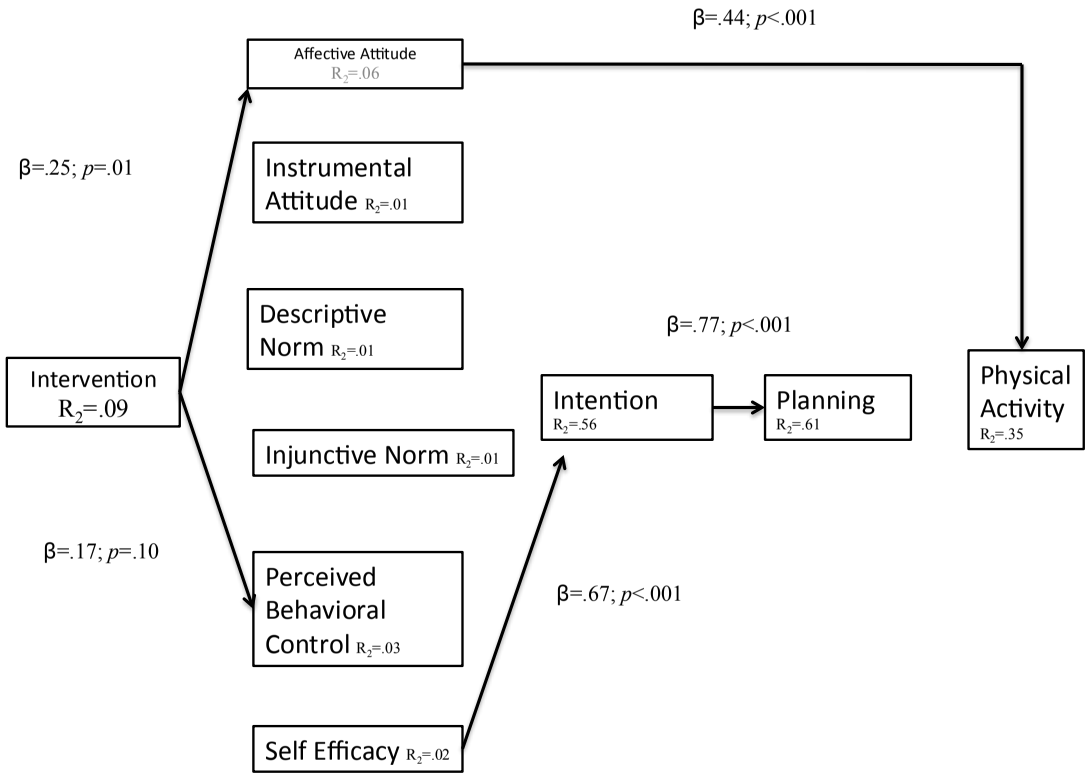

Figure 3. Path analysis of the relationship for participants reporting ≤300 minutes/week of physical activity at baseline between group assignment, theory of planned behavior constructs at 3 month and physical activity behavior at 3 months.

Chapter 8

Discussion

The purpose of this dissertation was to develop and evaluate a method to increase PA in YACS. To aid in behavior change, study 1 aimed to gain an understanding of key preferences and determinants of PA and the utility of sport to increase PA. Based on the results of study 1, in study 2, I developed a YACS specific TPB based PA guidebook. The guidebook was evaluated by experts; based on the expert suggestions the guidebook was modified to increase the likelihood of the guidebook's appropriateness and effectiveness. In the final study I evaluate the guidebook in a two arm randomized control trial where YACS were randomized to either receive the YACS specific theory based PA guidebook (TARG) or the Canadian Physical Activity Guidelines (CPAG). We compare PA behavior change, QoL and psychosocial constructs between the TPAG and the CPAG and analyzed the theoretical mechanisms of the PA change. Overall, key themes of these studies were that the guidebook improved PA for less active YACS, the guidebook improved QoL and psychosocial variables in YACS, that YACS are a very social group, YACS are a unique group compared to their older or younger peers and even within this unique group there is diversity in age, sex, cancer type, etc. The combination of these three studies provides health care workers and clinicians a way to provide cost effective, research based, and easy to deliver PA information to YACS.

Results of study 1 indicated that the majority of YACS were able and willing to do a PA program designed for YACS. YACS preferred to receive PA

information by written print material, which is consistent with previous research on behavioral change information preferences of young adult cancer survivors [1]. YACS also specified they would prefer to do PA in their community fitness center and with their friends and family. The combination of these factors indicated that a distance based approach with written PA information as means of providing PA information and supporting PA behavior change may be the most effective for this population. This observation is in line with previous research in older adults indicating that print based PA interventions yield stronger results than internet based research [2].

Study 2 was an evaluation of the appropriateness and perceived effectiveness of the guidebook by groups of experts including an oncologist, exercise oncology professionals, health information experts, TPB researchers and young adult cancer survivors. Feedback was collected in their relevant areas of expertise including the guidebook's organization, writing style, appearance, appeal, exercise content, medical content, suitability and appropriateness. The guidebook was edited based on their suggestions.

In the final study of this dissertation, based on the first two studies to create a targeted TPB based PA guidebook for YACS, I set out to determine if this guidebook would increase self reported PA compared to the CPAG. Contrary to our hypothesis, the TPAG did not increase PA minutes beyond the CPAG in the over all sample of YACS. YACS that responded to invitation to participate in this intervention were highly active, with minimal capacity for improvement in weekly PA minutes. For this reason, I explored YACS reporting less than 300

minutes of weekly PA at baseline. In this subsample, the TPAG was effective at increasing PA compared to the CPAG.

In this study, I provided the CPAG to the control group, which was beyond the current standard of care in Alberta, and in Canada. If a YACS desired information about PA they may or may not receive the CPAG. I thought it was important to compare the TPAG to what is currently publically available. This may have decreased the effect of the intervention, however, as the CPAG was also developed based on behavior change theories [3] and both groups were prompted to increase PA. Furthermore, volunteering to participate in a study about PA and receiving information on theory based PA may increase the PA behavior in both groups.

The TPAG had significant effects on the mental component score of the SF-36 scale and borderline significant effect on stress in the overall sample, and similar trends in the subsample under 300 minutes per week at baseline. It was unclear why there was an improvement in QoL and psychosocial variables in the overall sample of YACS without a change in PA; however, it could be because reading through the guidebook could give YACS a greater sense of control over PA by learning more about PA training principles, safety information and other relevant information for PA. It could have also provided a sense of community. Being diagnosed with cancer as a young adult is rare, with isolation being listed as one of the primary concerns of YACS [4]. Seeing pictures and reading quotes sharing similar experiences and having similar barriers to PA may decrease YACS' experience of isolation.

Similar improvements in QoL and psychosocial variables are presented in the under 300 weekly minutes of PA, however the results were not significant. This may be because of the small sample size when the highly active YACS were excluded. Future research should consider a larger sample size of YACS reporting under 300 weekly minutes of PA.

YACS are seemingly much more social than older cancer survivors. This was evident in YACS preferences for PA indicating they would prefer to do PA with friends, or other cancer survivors, which is in contrast with other cancer survivor groups that prefer to do PA alone [5-6]. Over half YACS indicate they would prefer to do PA at a community fitness centre, which conflicts with other cancer survivor groups that prefer to do PA at home [7]. This also could be due to the more peer oriented and social nature of individuals in their young adult years [8].

The social nature of YACS is also evident through the normative beliefs of the TPB. Normative beliefs, both descriptive and injunctive, had an effect on intention in the overall sample of YACS and YACS who were reporting less than 300 weekly PA minutes at baseline, indicating both peer support and peer behavior has an influence on the intention of YACS to perform PA. Emphasizing that social support and social networks should be considered when designing an intervention or clinical program for YACS.

While the guidebook addressed social support, it did not provide or influence social interactions with PA in a tangible way. Future research and programming for YACS should consider how to incorporate the social aspect of

PA either through social media, engagement in community programing, sports, organized events (ie. hiking day trip, ski days), adventure therapy expeditions or other physical activities with peers. Future research should also consider coaching on how to enhance PA specific social support.

Throughout these studies it was evident that YACS are a very distinct population compared to older or younger cancer survivors. A cancer diagnosis in the young adult years is unique physically, psychologically, emotionally, and practically among many other distinctions. Many of these unique features to a cancer experience at this age affect PA behavior, PA preferences and PA counseling. Physical distinctions in this population include a unique portfolio of cancer diagnoses. There are some cancers with the majority of the diagnoses within that age group (ie. thyroid). There are some cancers that involve hormones and present differently during the young adult years compared to older adults (ie. breast cancer). Unique diagnoses, followed by unique treatments, involve unique side effects. Following treatment, survivorship can be unique both due to the time of diagnoses, age and impact on the lives of YACS but also due to the extensive potential years of survivorship and unique delayed health concerns, both physical and psychological.

Young adult years are considered to be the most productive years [9]. The young adult years may consist of post secondary education, career development, establishing independence, marriage, having children, supporting a young family, purchasing a house, traveling etc. These activities can be stunted, change or not

exist with a cancer diagnosis in contrast to the average cancer survivor whose median age is 67 [10], many of who are retired.

PA decreases in the healthy population as the age increases with the most dramatic fall in PA after adolescence. This is due to a combination of factors including leaving high school, which may have gym programs, sports programs and intramural activities. Further, many individuals may leave their parents' influence and become more independent at this stage. This has the potential of raising barriers to PA. For example young adults may now be responsible for registration costs, transportation, and decision-making. Furthermore, they may have less time as they are now have more responsibilities.

Lack of time, stage of life, unique biological, diagnoses or treatment effects and preferences for PA make PA behavior and designing interventions to increase PA behavior different for YACS compared to older and younger cancer survivors. For example, when recruiting I received two phone calls from young adult cancer survivors asking if they still qualified for the study if they are pregnant. PA during pregnancy requires additional information and precautions above those for YACS highlighting the hormonal and other biological differences in this population.

In the cross sectional survey and the intervention studies, there was a low recruitment rate compared to similar studies performed in different cancer types. In the cross sectional survey I had a recruitment rate of 29%, and 38% excluding the wrong addresses which is a lower recruitment rate than similar survey research in other cancer survivor population for example recruitment rate was

43% in kidney cancer [11], 61% in colorectal cancer survivors [12], 51% in ovarian cancer survivors [13] and for bladder cancer survivors [6]. For the randomized control trial the recruitment rate was 11%, which is much lower than the similar Action trial that had a 25% recruitment rate of breast cancer survivors [14]. Low recruitment rates of YACS are similar to what has been reported in previous research [15-16]. Future research with YACS should consider the low recruitment rate and consider multiple reminders, and recruitment through different means in addition to the cancer registry such as social media, support groups, and traditional media.

Although YACS indicated that they preferred written material as means to receive PA information however, other YACS indicated that they would prefer face-to-face information (47.2%), information by email (45.9%), or information by internet (38.5%). The addition of more interactive components to the guidebook may increase its efficacy and long-term behavior change. Although, face to face counseling may be difficult due to the amount of rural YACS in Alberta and the lack of time, most YACS (95.8%) had access to the internet. Skype conversations with exercise professionals could be a valid alternative that would save on costs and overcome time and distance barriers. The addition of internet-based, social media, and email intervention could create a more complete and interactive intervention.

Although the guidebook was targeted for YACS it is important to note the diversity in this group. YACS are studied as a separate population due to similarities in age and being an understudied group, however there are immense

differences within this population such as cancer type, treatments, long-term effects, PA preferences, support systems etc. The addition of an internet based intervention to the guidebook could allow for a more individualized approach, based on behavior change needs, preferences, and other relevant factors. The addition of an internet based approach could also allow YACS to track behavior, receive feedback, prompts etc. Future research should consider evaluating the 'Stride to Survive' guidebook with the addition of complimentary internet based intervention.

Future Research

Future research should consider the addition of concurrent qualitative research during the initial creation, ongoing development and evaluation of the YACS specific guidebook. Qualitative research would be particularly useful to establish what information YACS would like included in the guidebook, how they think it would best be presented, and most importantly, why this information would be the most beneficial information. Establishing an understanding of why certain information or certain formats should be used would enhance the effectiveness of the current YACS specific guidebook. To obtain this information focus groups with the target users would be particularly useful. Focus groups provide in-depth information to be gained from a variety of perspectives [17], thus providing an indication of different factors that might need to be considered in the development of the guidebook. Focus groups also allow for dynamic interactions within the group providing direct evidence of similarities and differences between

experiences [18]. Participants can "bounce ideas" off each other, which might eventually lead to a group consensus on what should be included and the different reasons why. Finally, focus groups would be useful for program evaluation, as participants could discuss what could be added or taken away from the guidebook, what supportive technique would be preferred (eg. interactive website, social media, etc.) and why. Overall, the addition of concurrent focus groups would add depth to the development, evaluation and knowledge translation of YACS specific guidebook.

As mentioned above, adventure therapy (AT) could be a potential intervention to promote PA. Staunton [19] defines adventure therapy (AT) as an 'adventure experience with diagnosed clients or reporting a specified therapeutic outcome'. Adventure therapy was traditionally used for adolescents with emotional problems, additions or disabilities [20] but has recently been used in many populations including YACS [21], adolescent cancer patients [22] and pediatric cancer survivors [23]. One of the key components of AT is to use metaphors, enhancing their ability to transfer lessons learned in the expedition to their daily life [24].

According to previous research, it is difficult to recruit YACS to clinical trials, such as traditional PA interventions involving supervised exercise sessions [15]. Difficulties recruiting YACS has also been described by other researchers [21-25]. This may be due to numerous reasons such as family obligations, work responsibilities, location and being a transient population [26]. Hence, two of the main barriers to recruiting YACs in physical activity interventions is

inaccessibility and its incompatibility with the various lifestyles of YACS. AT offers a possible way to overcome these two barriers YACS have to engaging in PA.

AT includes one or more physical tasks. Examples of tasks are climbing a mountain, kayaking, hiking, surfing and trail running. These physical tasks are usually challenging to the participant both physically and mentally. I hypothesize that the PA skills acquired during participation in AT, including improvements in self-efficacy for PA and social support for physical activity will lead to improvements in physical self-concept.

In a study about preference of behavior Rabin et al [8] reported that YACS desire targeted intervention for their age group that accommodated their multiple competing needs (work, family etc). YACS also expressed a need for the intervention to provide social support. These preferences can be satisfied through AT. AT can be age appropriate for young adults incorporating tasks and themes addressing the survivorship needs of young adults. AT is usually offered as a one off trip, rather than multiple times a week. This may be more conducive for the busy young adult lifestyle. AT will also surround YACS with peers, with the potential of creating social support in several aspects of survivorship, including PA.

Sports holds promise to increase PA and QoL in YACS. Future research should evaluate how to increase sports participation among YACS. In study 1, paper 2 YACS indicated their preferred sport was golf, although it is important to know over 100 summer and winter sports were named when YACS were asked to

indicate their sport preferences. Golf is considered a moderate intensity sport and increases trunk stability. A future intervention could use golf, or golf in combination with other sports or activities as an intervention to increase PA in YACS.

The combination of studies 1 through 3 created a guidebook effective in increasing PA in YACS that report less than 300 minutes weekly of PA; this is not sufficient to get YACS active. Actions need to be taken to get the relevant information to health care providers, to respond to inquiries about the guidebook and to gain support of the cancer group necessary to get YACS the guidebook. The dissemination of information, interest of health care providers for such a guidebook and local programming should be accessed.

There is still an extensive amount of research to be conducted to determine the exact prescription of PA for YACS. Although the current research has helped define the behavioral aspects of PA for YACS, the specific frequency, intensity, time and type of PA is based on the Canadian PA guidelines and the PA guidelines for cancer survivors in general. Given the unique biological differences of YACS, the treatment and the increased possibility of long term effects of cancer [27] and its treatments, YACS may have a unique PA prescription. This prescription could consider the inclusion of vigorous activity into the guidelines, which may not be possible for average cancer survivor diagnosed in their 60s.

Strengths and Limitations

This dissertation should be evaluated in context of its strengths and limitations. Overall, a strength of this dissertation is the novel population of

YACS. The use of a provincial registry, the Alberta Cancer Registry, to recruit patients which holds record of all cancer survivors diagnosed in Alberta is an asset for this research. According to Rabin et al. [15] the use of a population-based registry is the most productive method to recruit YACS. Another strength is that each of the studies informed the next and the inclusion of input from YACS at every stage of the research. The use of an RCT to evaluate the PA behavior change capacity of the YACS guidebook and that the survey study and RCT included validated measures of QoL, psychosocial and TPB measures are other strengths of the dissertation.

Limitations of the dissertation were that there was no objective measure of PA. Using only self reported PA may result in an under representation or more commonly an over representation of PA. We used a validated measure of PA. This is the same measure used in previous cancer and PA research [5-6, 11-14] for comparisons.

The response rate for the survey study and the RCT were low compared to similar studies in other cancer populations. This would indicate that our sample size is not representative of the population it was intended to represent. We attempted to increase the response rate in both trials by having an initial invitation, followed by two reminders for participation. Recruitment is a common struggle in YACS [15]. In the future a combination approach of registry mail out, in clinic recruitment and social media could produce improved response rates. Another idea to improve response rates could be to add the addition of a small incentive with the completion of the survey or trial.

Adherence to the RCT (ie reading the guidebook) was modest. If only about half the YACS did not read the CPAG or TPAG, our claims that the interventions are responsible for any change in behavior are weak. We tried to address this by requesting YACS read the guidebook frequently and place it in a predominant location. Future research should consider prompts by email or text to read through the guidebook, or sections of the guidebook.

Other limitations include that the participants to our studies were a highly active sample in the RCT. For a behavior change trial, there needs to be the ability to increase the behavior. With PA already being so extensive in this population it We intended to recruit a less active sample by including a statement in the invitation as inclusion criteria that participants are interested in increasing their PA by 30-60 minutes/week. However, this method was not successful. In future research a initial screening of PA should be administered, which has been successful in previous research [28-29].

In conclusion, my dissertation offers insight to the key determinants, preferences and information to support the delivery of PA information for YACS to further inform future studies and clinical practice. YACS who may benefit the most from a PA intervention would be YACS reporting under 300 minutes of PA weekly at point of intervention. YACS have expressed the preference to participate in a variety of activities. Most popular activities in the winter were walking, skiing and team sports, and in the summer the most popular activities were walking, biking and swimming. An intervention that offers a choice of activities may be the most effective. YACS preferred to participate in PA in their

community fitness center, which would support providing a distance based approach to deliver PA information. The ideal time to offer PA information would be 3-6 months post treatment. The guidebook was effective at changing PA behavior for YACS reporting under 300 minutes of PA at baseline.

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Appendix A

Literature Review

Currently, 12 PA behavior change trials for cancer survivors have been done and one study that is being developed. The majority of the research was done in breast cancer survivors, a couple studies with prostate cancer, one in colorectal and one with a mixed group of cancer survivors. Half the behavior (including the design study) change studies are framed from the Social Cognitive Theory, four used the Transtheoretical Model and two where framed by the Theory of Planned Behavior. The interventions where conducted by telephone counselling, motivational interviewing, group meetings, written health material, pedometers or some combination of modes.

Jones et al. [1] a single blinded, randomized control trial (RCT), designed to examine the effects of an oncologist recommendation to exercise on self-reported PA behavior in newly diagnosed breast cancer survivors. In this study, 450 breast cancer survivors were randomized to either receive an oncologist recommendation for PA, an oncologist recommendation with a referral to an exercise professional or usual care. Following the initial treatment consultation, trained oncologists made appropriate recommendations and referrals. One week later, all participants were mailed a questionnaire package that assessed self-report PA, TPB variables, and recall an oncologist recommendation. Participants who returned questionnaires received a telephone call 5 to 6 weeks following ignition visit to assess self-reported PA behavior. The participants in the recommendation-only group reported 3.4 more MET hr of total PA and approximately 30 min more moderate intensity PA per week compare to the usual

care. Only 10% of the participants in the usual care group were meeting the public health guidelines compared to 21% in the recommendation only group. It is however, important to note that 41% of the participants correctly recalled the PA recommendation. Participants who recalled a PA recommendation reported 4.2 more MET hr of total PA per week and approximately 50 minutes more moderate PA per week with comparison of participants who did not recall a PA recommendation.

Pinto et al.[2] randomized 86 sedentary women into a PA home-based PA intervention or control group. The PA intervention was based on the Transtheoretical Model. The intervention group received in-person instructions on how to exercise at a moderate-intensity level. Participants were taught skills such as how to monitor their heart rate, warm up and cool down. They also received a log book to self-monitor their activity and a pedometer. Participants were encouraged to progressively increase their activity to 30 minutes of moderate PA, 5 days a week. Participants received a weekly telephone call for 12 weeks. Each session was tailored to the participant's motivational readiness. The conversations addressed progress of PA, problem solve any barriers and provide positive feedback. Participants received a PA and cancer survivorship weekly over the intervention. They also received a personal letter summarizing their progress or barriers at 4 time points during the study. Participants in the control group where encouraged not to change their current PA level.

Basen- Engquist et al. [3] reported the results of their pilot study of a six month, 21-session intervention to increase breast cancer survivors' PA. Sixty

breast cancer survivors were randomized into either a lifestyle intervention or a standard group. Each session lasted 90 minutes and was based on the Transtheoretical Model. The sessions taught the benefits of PA, making small changing, overcoming barriers, goal setting, rewarding yourself, and self-monitoring. The groups were 7-15 participants, the first 50 minutes of each session were spent teaching cognitive-behavioral skills related to PA and provided a brief opportunity (2-10 min) to practice moderate intensity PA, given a 10 minute break then reconvene and discuss breast cancer related activity. Participants were tested at baseline and after 6 months. They were asked to fill out a quality of life and motivational readiness questionnaire, five physical performance tests, 7-day PA recall interview, and lymphedema assessment. Participants in the intervention group improved in some performance measures and the physical aspect of QoL beyond those of the control group. The intervention group increased their motivational readiness but not increase their PA in the 7 day PA recall interview.

Demark-Wahnefried [4] developed Project Leading the Way in Exercise and Diet (LEAD) a 6 month home-based intervention for breast and prostate cancer survivors older than 65 years. The primary purpose of the trial is to determine the intervention can improve the physical functioning of older breast and prostate cancer survivors. The intervention consisted of telephone counselling and tailored print material aimed at increasing exercise and improving diet. The project did not meet its accrual target of 420 participants, 182 participants were randomized. The intervention did not produce changes in PA that achieved

statistical significance, although the trend was in the expected direction. On average participants in the intervention group expended +111 kcal/week compared to the control group that expended -400kcal/week. These findings suggest that a home-based diet and exercise intervention holds promise to improve lifestyle behaviors among older cancer survivors.

Carmack-Taylor [5] examined the efficiency of a 6 month (Lifestyle) PA program based on the for prostate cancer survivors to improve QoL. A total of 134 prostate cancer survivors receiving androgen-ablation were randomized to the Lifestyle, Educational Support Program or a Standard Care Program (no group). Participants in the Lifestyle and Educational Support Program attended small group meetings for 6 months: both groups included an orientation, 16 weekly sessions and four biweekly sessions. Each session lasted approximately 1.5 hours. The Lifestyle intervention implemented a cognitive-behavioral curriculum focused on increasing PA, no PA skills training was provided. The Lifestyle group were taught and practiced self-monitoring, goal setting, problem-solving, overcoming barriers, cognitive restructuring, and rewarding oneself. Participants were also given a pedometer to track their steps. The Educational Support Program provided facilitated discussion. The last half hour of both the Lifestyle and Educational Support Program an expert came in to discuss relevant to prostate cancer survivors. The Standard Care Program did not meet as group but received one mail out of education and information about community resources. The Lifestyle intervention was successful changing participant's thoughts about PA and the strategies they used to be more active. Lifestyle participants reported a

greater increase in stage of change relative to the other study conditions. Participants in the Lifestyle intervention did not significantly increase in PA or increase self-efficacy compared to the other groups. Results suggest that cognitive-behavioral skills training is not sufficient in promoting routine PA in these patients.

Bennett et al.[6] examined how motivational interviewing can help increase PA and improve improvement aerobic fitness, health and fatigue in a mixed group of cancer survivors over 6 months. The intervention group received a counselling session lasting approximately 30 minutes and consisting of a conversation consistent with MI and tailored according to the needs of each participant. The counsellor does not educate on or offer advice about PA, instead they use careful listening, summarizing, feedback and affirmation and tries to build the participant's self-efficacy. Each participant was given a pedometer but participants were not required to walk if they preferred other modes of PA. Two weeks after the initial visit and again at 2 months and 4.5 months the counsellor telephoned the participants and discussed any barriers they be having to adopting the new behaviors. The participants returned for testing at 3 and 6 months and were given opportunity to speak with the counsellor. The intervention group increased their self-reported PA by a mean of 1,556 kcal/week compared to a mean of 397kcal/week in the control group. The evidence also goes to support self-efficacy as being a key concept of PA behavior change, as suggested by both the social cognitive theory and the Transtheoretical Model. The suggestion from this study is that self-efficacy is not enough for behavior change but the

combination of self-efficacy and motivational interviewing is what was so successful.

The FRESH START [7] tested the efficacy of sequentially tailored versus standard mailed print material on improving diet and PA behavior. A total of 543 individuals with newly diagnosed early stage breast and prostate cancer survivors were randomized. The intervention was a 10 months and involves an initial personalized workbook, followed by a series of seven newsletters at six week intervals both tailored to individuals stage of readiness, barriers, progress towards PA goal. The FRESH START program was developed based on the Social Cognitive Model and the Transtheoretical Model. The standard material consisted of written material available in the public domain. The standard material arm increased significantly in PA, however the intervention arm had far greater increases in PA. This study concluded that mailed print material, especially tailored print material is effective in increasing lifestyle behaviors in cancer survivors.

Matthews et al.[8] designed a study to evaluate a 12-week home-based walking intervention for breast cancer survivors and to quantify changes in PA behaviors, body weight and body composition. Twenty two breast cancer survivors were randomized to the intervention and fourteen to a wait list control. The wait list control was asked not to increase their PA until after the last assessment. The intervention consisted of a in person visit followed up by five short telephone counselling calls. The initial counselling session emphasized goal setting, and PA safety. The phone calls were designed to monitor participant's

safety and enhance adherence through structured behavioral counselling that was grounded in Social Cognitive Theory. As semi structured script was used by the counsellors in each of the calls. They discussed meeting or not meeting the PA goal, positive reinforcement, barriers, and opportunities for social support. Participants self-reported daily PA, daily steps, rate of perceived exertion (RPE) and were reported weekly. The findings suggest home-based walking intervention was safe and effective for increasing short-term PA levels among breast cancer survivors.

The ACTION Trial [9] was a randomized control trial designed to determine the effects of breast cancer specific print materials and step pedometers on PA and QoL in breast cancer survivors. Breast cancer survivors were randomized to receive one of the following: (1) a breast cancer specific PA guidebook, (2) a step pedometer, (3) pedometers and PA guidebook and (4) a standard PA recommendations. All three intervention arms reported a greater increase of PA than the standard PA recommendations. PA increased on average 30 minutes/week in the standard recommendation groups, 70 minutes/week in the print material 89 minutes/week in the pedometer group and 87 minutes/week in the combined group. The combination of group with both the pedometers and the guidebook also reported significantly greater improved QoL and reduced fatigue than the standard recommendation group.

Bloom et al. [10] recruited young (under 50 at diagnosis) breast cancer survivors 5 years post treatment. The women in the intervention group were asked to attend three 1-day workshops that took place at monthly intervals. The three

sessions were put together to honour the participant's past, present and future. They addressed informational needs, promoting PA and diet, improving communication skills, and providing and receiving emotional support. The second session was to promote healthy behaviors, with emphasis on PA. An exercise physiologist spoke about the importance of weight-bearing PA, and lead the women through a 30 minute exercise session. The women received a personal assessment by exercise physiologist and exercise prescription. Participants who were not able to attend one of the group sessions they were mailed the information presented at the session. This short term intervention can improve QoL by increasing knowledge levels and begin efforts toward lifestyle improvements such as PA. Participants that received the information in the mail and were not able to attend the sessions outcomes were the same as those that attending the sessions. This implies that the information, not necessarily the interactions that provided the benefit. There were differences between PA levels of participants but not in the other behaviors.

Hawkes [11] conducted a six week telephone-delivered pilot study to 20 colorectal cancer survivors delivered by health coaches, supported by an interactive handbook (CanChange). The program assessed feasibility, health outcomes, quality of life, and lifestyle variables (including PA). CanChange was grounded in Social Cognitive Theory with focus on the core determinants of health behavior including benefits of the behavior, self-efficacy, outcome expectations, as well as specific strategies for achieving positive health behavior change. The delivery of the intervention was 6 weekly 45 minute telephone

sessions and an informational and interactive handbook to assist with personal assessment and goal setting. The pilot was a success, 100% intervention retention rate and said that the program made them more motivated to make positive changes. Overall, 76% of the participants rated the program as excellent. There were non-significant improvements in PA. This study suggests there is potential in a theory based program to improve behavior change in colorectal cancer survivors.

Rogers et al.[12] reports the feasibility and preliminary outcomes of a pilot trial to increase PA in breast cancer survivors receiving hormone therapy (BEAT Cancer trial). The trial was based on the Social Cognitive Theory and also on preferences of breast cancers reported in a previous study. The intervention group attended six discussion group sessions with a clinical psychologist who encourages social support, provide breast cancer PA role models, and cover journaling, time management, stress management, dealing with exercise barriers, and behavior modification addressing the constructs of Social Cognitive Theory. Participants also got 3 supervised PA sessions and 3 individual face-to-face counselling sessions with a PA specialist. To add to the self-monitoring component, participants were asked to 'convert' their times spent doing PA to 'miles' which were graphed on a map indicating travel across the United States. The usual care group was given print material available in public domain. The BEAT cancer program had significant improvements in PA counts measured by accelerometer, muscle strength and social well-being. There was also a significant decrease in hip-to-waist ratio and joint stiffness in the intervention group. The

competition part of the intervention (travel across the United States) was not well received by the participants. The one-on-one sessions with the exercise specialist was felt to be the most helpful part of the intervention.

Basen-Engquist et al. [13] published a design paper for a study for increasing physical activity in endometrial cancer survivors. The design is a 6 month intervention consisting of exercise prescriptions, telephone counselling and written materials based on the Social Cognitive Model. The program will facilitates mastery experiences by goal setting, verbal persuasion, social support, benefits of PA, modeling of the adoption and maintenance of PA, training in behavior self-regulatory skills and feedback and problem solving. The study will explore how cancer survivors forms self-efficacy expectations about PA, including how cardiorespiratory fitness and somatic sensations during exercise influence self-efficacy. The intervention will involve complete assessment of fitness, activity, self efficacy, and outcome expectations, and determinants of self-efficacy.

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Appendix B

Authors	Cancer Diagnosis	Age (years)	Sample size	Primary Outcomes	Intervention	Theory	Findings
Jones et al. (2004)	Breast cancer survivors	M= 56 SD=12	450 breast cancer survivors	1.PA	Oncologist exercise recommendations Referral to exercise specialist	Theory of planned behavior	A significant difference in total activity in favor of the recommendation only group over the usual care group There was no difference in activity level between the recommendation plus referral group and usual care group Participants who recalled an exercise intervention reported significantly more total exercise than participants that did not recall the recommendation
Pinto et al. (2005)	Breast cancer survivors	Intervention M=53.42 SD= 9.08 Control M=52.86 SD= 10.38	86 breast cancer survivors	?	1 in person counseling visit 12 weekly telephone counseling	Transtheoretical Model	PA intervention successfully increased moderate-intensity PA and overall PA compared to the control group PA intervention participants were more likely to progress in their motivational readiness than control group PA intervention did not demonstrate significant effects on an objective measure of PA or two anthropomorphic measures.
Basen-Engquist et al. (2006)	Breast cancer	Intervention M=55.7 SD=11.1 Standard Care M=54.4 SD=11.7	60 BC survivors	1.PA	21 90-min group meetings over 6 months	Transtheoretical Model	PA intervention produced improvements in physical function, and physical aspects of QoL Both the standard care and intervention group increased their total PA minute.
Demark-Wahnefried (2006)	Breast and prostate cancer survivors (age 65+ years)	M=71.5 SD=4.4	182 Breast and prostate cancer survivos with 18	1.physical functioning	Telephone counselling Tailored print material		PA intervention did not produce changes in PA that achieved statistical significance

			months of diagnosis				
Carmack-Taylor et al. (2006)	Prostate cancer survivors	M=69.2 Range 44.8-89.0	134 prostate receiving continuous androgen-ablation	1.QoL 2.PA	16 weekly sessions, 4 biweekly session small group meetings	Social Cognitive Theory Transtheoretical Model	No significant changes in PA were reported. Intervention group changed their thoughts about activity PA intervention group has a greater increase in stage of change compared to the usual care group
Bennett et al. (2007)	Any long-term (at least 6 months post treatment)	Intervention M=55.5 SD= 8.9 Control M=60.1 SD=11.0	56 cancer survivors	1. ↑PA 2. aerobic fitness, health, and fatigue	Motivational Interviewing		PA intervention group increased their self-reported PA by a mean of 1,556 kcal per week compared to the mean of 397 kcal per week in the control group.
Demark-Wahnefried (2007)	Breast and prostate cancer survivors	M=57.0 SD=10.8	Total= 543 BC=306 Prostate =237	1.Diet and PA	Tailored handbook 7 newsletters in 6 week intervals -all print mailed material	Social Cognitive Theory Transtheoretical Model	PA intervention was successful at increasing of weekly number of minutes exercising from 53.4 minutes at baseline to 112.7 at 1 year follow up
Matthews et al. (2007)	Breast cancer survivors	Intervention M=51.3 SD=9.0 Usual care M=56.9 SD=12.3	36 post treatment breast cancer survivors	PA, body weight, body composition	1 in person counseling visit 5 short telephone counseling sessions	Social Cognitive Theory	Home based walking intervention safe and effective Intervention group walking MET increase from 4.9 at baseline to 16.8 post intervention, usual care group only increased from 5.0 to 6.0
Vallance et al. (2007)	Breast cancer survivors	M=58 Rage 30-90	377 cancer survivors	1. PA 2. QoL	Tailored PA guidebook pedometers	Theory of Planned Behavior	3 interventions groups reported greater increases in self-reported PA by about 40 to 60 mins/week and brisk walking by 60-90 minutes/week. The group with the guidebook and pedometer reported improvements in QoL and fatigue compared with the standard recommendation group

Bloom et al. (2008)	Young breast cancer survivors	At diagnosis 23-39 (n=51) 40-44 (n=117) 45-50 (n=236)	404 young BC survivors at 5 years post treatment	1.Knowledge of cancer 2.Lifestyle (PA and diet) 3.Communication	Three one day workshops		PA is only behavior that significantly change Participants reported an increase in the amount of PA but not the number of sessions of PA per week
Hawkes et al. (2009)	Colorectal cancer survivors	Median=66.0	20 colorectal cancer survivors	Feasibility, health outcomes, QoL, lifestyle (inc. PA)	Tailored handbook Telephone counselling	Social Cognitive Theory	76% of participants rated the program as excellent and 100% said the program made them more motivated to make positive life choices Non significant changes in PA
Rogers et al. (2009)	Breast cancer survivors	M=53 SD=9	41 breast cancer survivors receiving hormonal therapy	1.PA 2.QoL	6 group discussion sessions 12 individual supervised PA sessions 3 individual counseling sessions	Social Cognitive Theory	PA intervention significantly improved PA PA intervention significantly decreased waist-to-hip ratio Pa intervention increased joint stiffness Even though there was an improvement in PA, only 60% of the intervention group where achieving public health PA guideline
Basen-Engquist (2011)	Endometrial Stage I-IIIa	n/a	n/a	1.PA 2. determinants of self efficacy	Exercise prescription Telephone counselling Written material Over 6 months	Social Cognitive Theory	Design paper

Appendix C

Date Completed: _____ Identification #_____

Physical Activity in Young Adult Cancer Survivors

Principal Investigator: Kerry S. Courneya, PhD, University of Alberta

Instructions

Thank you for agreeing to participate in this study. In this questionnaire, we are going to ask you a series of questions about yourself. Many of the questions ask you about your physical and mental health, and some may be viewed as quite personal. It is important to answer these questions if at all possible, however, if you feel uncomfortable answering certain questions please leave them blank. All responses are completely confidential and will never be used in any way that could link them to you. Many of the questions may seem similar but it is important to treat each question separately and provide an answer for each. There are no right or wrong answers and all we ask is that you provide responses that are as honest and accurate as possible. The questionnaire should take about 30-45 minutes of your time to complete. If you have any questions about completing the questionnaire, please contact Lisa Belanger (Project Director) at 492-2829 or lbelange@ualberta.ca.

IMPORTANT: For this survey, we are focusing on leisure-time physical activity. Leisure time means activity done during your free time and does not include your work/job or household chores. Physical activity means any exercise or sport that results in a substantial increase in energy expenditure (resulting in a noticeable increase in heart rate and breathing rate). Examples of exercises include brisk walking, jogging, cycling, swimming, and dancing. By sport, we mean any physical activity where physical skill influences the outcome of a competition. Examples include golf, soccer, bowling, curling, tennis, and skiing. Please do not include sports that don't require much energy expenditure (e.g., shooting pool, darts, etc.).

For this first question, we would like you to recall your average weekly participation in leisure time physical activity (exercise and sport) during the past month. Please note that from here on out we will use **PA** as a short form for physical activity.

When answering these questions please:

* only count PA sessions that lasted 10 minutes or longer in duration.

* only count PA that was done during free time (i.e., not occupation or housework).

* note that the main difference between the three categories is the intensity (effort).

* write the average frequency on the first line and the average duration on the second.

Considering a typical week (7 days) over the PAST MONTH how many days on average did you do the following kinds of PA and what was the average duration?

	Days Per Week	Average Minutes Each Day
a. STRENUOUS ACTIVITIES (HEART BEATS RAPIDLY, SWEATING) (e.g., running, aerobics classes, cross country skiing, vigorous swimming, vigorous bicycling).	_____	_____
b. MODERATE ACTIVITIES (HEART RATE INCREASES, PERSPIRATION) (e.g., fast walking, tennis, easy bicycling, easy swimming, popular and folk dancing).	_____	_____
c. LIGHT ACTIVITIES (MINIMAL EFFORT, NO PERSPIRATION) (e.g., easy walking, yoga, bowling, lawn bowling, shuffleboard)	_____	_____

The next 3 questions ask about three specific types of activities that you may have done over the past month. Please provide answers for each of the 3 specific activities.

(a) STRENGTH EXERCISES (e.g., weight lifting, sit-ups, push-ups)

Have you done any strength exercises in the past month? Yes No

If yes, what type(s) of strength exercise did you do?
_____

How often did you do them? _____ days per week.

How long did they usually take you? _____ minutes each day.

(b) WALKING (for at least 10 minutes at one time, e.g., for exercise, to work or store)

Have you walked for at least 10 minutes at one time in the past month? Yes No

If yes, would you say your walking pace was usually casual (a normal walk) or brisk (like you were late for an appointment)? Please circle: Casual Brisk

How often did you usually walk for at least 10 minutes?
_____ days per week.

How long did you usually walk for on those days?
_____ minutes each day.

(c) SPORTS (activities where physical skill influences the outcome of a competition such as golf, soccer, bowling, tennis, skiing, etc.)

Have you participated in any sports in the past month? Yes No

If yes, what type of sport(s) did you do?
_____

How often did you usually play? _____ days per week.

How long did you usually play for? _____ minutes each day.

For the rest of our questions, we ask you to focus on regular PA. We define regular PA as any moderate intensity physical activity (e.g., brisk walking) that is done at least 5 days per week for at least 30 minutes each day OR any vigorous intensity physical activity (e.g., jogging) that is done at least 3 days per week for at least 20 minutes each day.

What do you think would be the benefits for you if you participated in a regular PA program and what would make PA fun or enjoyable for you? (List up to three each).

What would be the benefits to you?	What would make it fun for you?
_____	_____
_____	_____
_____	_____

What factors make it easier or more difficult for you to stick with a regular PA program?

Factors that make it difficult for you	Factors that make it easier for you
_____	_____
_____	_____
_____	_____

Which people or groups that are important to you would support you participating in a regular PA program?

Important people that would support you	Important people that are already doing regular PA themselves
_____	_____
_____	_____
_____	_____
_____	_____

The following questions ask you to rate how you feel about regular PA over the next month. Please pay careful attention to the words at each end of the scale and circle the number that best represents how you feel. Please answer all items.

I think that for me to participate in regular PA over the next month would be:

	1	2	3	4	5	6	7
(a)	extremely harmful	quite harmful	slightly harmful		slightly beneficial	quite beneficial	extremely beneficial
(b)	extremely unenjoyable	quite unenjoyable	slightly unenjoyable		slightly enjoyable	quite enjoyable	extremely enjoyable
(c)	extremely unimportant	quite unimportant	slightly unimportant		slightly important	quite important	extremely important
(d)	extremely boring	quite boring	slightly boring		slightly fun	quite fun	extremely fun

I think that if I participated in regular PA over the next month, most people who are important to me would be:

	1	2	3	4	5	6	7
(a)	extremely discouraging	quite discouraging	slightly discouraging		slightly encouraging	quite encouraging	extremely encouraging
(b)	extremely unsupportive	quite unsupportive	slightly unsupportive		slightly supportive	quite supportive	extremely supportive

I think that over the next month, most people who are important to me will themselves participate regularly in PA.

	1	2	3	4	5	6	7
(a)							

strongly disagree	moderately disagree	slightly disagree		slightly agree	moderately agree	strongly agree

These next questions ask you to rate how likely it is that you would be able to participate in regular PA over the next month if you were really motivated. Pay careful attention to the words in each scale. Circle the number that best represents how you feel.

If you were really motivated…

1. How much control would you have over doing regular PA over the next month?

1	2	3	4	5	6	7
very little control			some control			complete control

2. How confident are you that you could do regular PA over the next month?

1	2	3	4	5	6	7
not at all confident		somewhat confident		quite confident		completely confident

This next set of questions ask you about your motivation and plans to do regular PA over the next month. Pay careful attention to the words at the end of each scale.

1. Do you intend to do regular PA over the next month?

1	2	3	4	5	6	7
no, not really			somewhat intend			strongly intend

2. How motivated are you to do regular PA over the next month?

1	2	3	4	5	6	7
not at all motivated		somewhat motivated		quite motivated		extremely motivated

3. Do you have plans for when, where, and the type of PA you will do in the next month?

1	2	3	4	5	6	7
no specific plans			some general ideas			very detailed plans

4. How much **vigorous** intensity PA do you intend to do over the next month?

_____ days per week for _____ minutes each day (write in numbers including 0)

5. How much **moderate** intensity PA do you intend to do over the next month?

_____ days per week for _____ minutes each day (write in numbers including 0)

This set of questions asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. Answer every question by marking a single answer. If you are unsure about how to answer a question please give the best answer you can.

1. In general, would you say your health is:

1	2	3	4	5
Excellent	Very good	Good	Fair	Poor

2. Compared to one year ago, how would you rate your health in general now?

1	2	3	4	5
Much better now than one year ago	Somewhat better now than one year ago	About the same as one year ago	Somewhat worse now than one year ago	Much worse than one year ago

3. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

		Yes, limited a lot	Yes, limited a little	No, not limited at all
a.	**Vigorous Activities**, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b.	**Moderate Activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
c.	Lifting or carrying groceries	1	2	3
d.	Climbing **several** flights of stairs	1	2	3
e.	Climbing **one** flight of stairs	1	2	3
f.	Bending, kneeling or stooping	1	2	3
g.	Walking **more than a mile**	1	2	3

h.	Walking **several hundred yards**	1	2	3
i.	Walking **one hundred yards**	1	2	3
j.	Bathing or dressing yourself	1	2	3

4. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Cut down on the **amount of time** you spent on work or other activities	1	2	3	4	5
b. **Accomplished less** than you would like	1	2	3	4	5
c. Were **limited** in the **kind** of work or other activities	1	2	3	4	5
d. Had **difficulty** performing the work or other activities (e.g.,, it took extra effort)	1	2	3	4	5

5. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Cut down on the **amount of time** you spent on work or other activities	1	2	3	4	5
b. **Accomplished less** than you would like	1	2	3	4	5
c. Did work or other activities **less carefully than usual**.	1	2	3	4	5

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

1	2	3	4	5
Not at all	Slightly	Moderately	Quite a bit	Extremely

7. How much bodily pain have you had during the past 4 weeks?

1	2	3	4	5	6
None	Very mild	Mild	Moderate	Severe	Very severe

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

1	2	3	4	5

Not at all	A little bit	Moderately	Quite a bit	Extremely

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give one answer that comes closest to the way you have been feeling.
How much of the time during the past 4 weeks…

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Did you feel full of life?	1	2	3	4	5
b. Have you been very nervous?	1	2	3	4	5
c. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5
d. Have you felt calm and peaceful?	1	2	3	4	5
e. Did you have a lot of energy?	1	2	3	4	5
f. Have you felt downhearted and depressed?	1	2	3	4	5
g. Did you feel worn out?	1	2	3	4	5
h. Have you been happy?	1	2	3	4	5
i. Did you feel tired?	1	2	3	4	5

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

1	2	3	4	5
All of the time	Most of the time	Some of the time	A little of the time	None of the time

11. How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a. I seem to get sick a little easier than other people	1	2	3	4	5
b. I am as healthy as anybody I know	1	2	3	4	5

c. I expect my health to get worse	1	2	3	4	5
d. My health is excellent	1	2	3	4	5

The questions in this scale ask you about your feelings and thoughts during the last month. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each one fairly quickly. For each question, please choose from the following alternatives:

	0 never	1 almost never	2 some-times	3 fairly often	4 very often
In the last month, how often have you…					
1. been upset because of something that happened unexpectedly	0	1	2	3	4
2. felt that you were unable to control the important things in your life	0	1	2	3	4
3. felt nervous and stressed	0	1	2	3	4
4. dealt successfully with irritating life hassles	0	1	2	3	4
5. felt that you were effectively coping with important changes that were occurring in your life	0	1	2	3	4
6. felt confident about your ability to handle your personal problems	0	1	2	3	4
7. felt that things were going your way	0	1	2	3	4
8. found that you could not cope with all the things that you had to do	0	1	2	3	4
9. been able to control irritations in your life	4	0	1	2	3
10. felt that you were on top of things	0	1	2	3	4
11. been angered because of things that happened that were outside of your control	0	1	2	3	4
12. found yourself thinking about things that you have to accomplish	0	1	2	3	4
13. been able to control the way you spend your time	0	1	2	3	4
14. felt difficulties were piling up so high that you could not overcome them	0	1	2	3	4

The following questions concern the general perceptions that you currently have about yourself. Please circle the number that best reflects your current view of yourself using the following scale as a guide for your responses.

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

13

Below is a list of statements concerning how you might have felt or behaved in the past week. Please use the following scale to indicate how often you felt or behaved in these ways in the past week.

0	1	2	3
Rarely or none of the time (< 1 day)	Some of the time (1-2 days)	Much of the time (3-4 days)	Most or all of the time (5-7 days)

During the PAST WEEK:

1. I felt depressed.	0	1	2	3
2. I felt that everything I did was an effort.	0	1	2	3
3. My sleep was restless.	0	1	2	3
4. I was happy.	0	1	2	3
5. I felt lonely.	0	1	2	3
6.People were unfriendly.	0	1	2	3
7. I enjoyed life.	0	1	2	3
8. I felt sad.	0	1	2	3
9. I felt that people disliked me.	0	1	2	3
10. I could not get "going".	0	1	2	3

This next set of questions ask you about your PA and sport preferences. Check only one response for each question unless otherwise indicated.

Would you have liked to receive information about PA at some point after your cancer diagnosis?

_____ Yes _____ No _____ Maybe/Unsure

***Even if you responded NO, please answer the following questions**.

Do you think you would be able to do a PA or sport program for young adult cancer survivors?

_____ Yes _____ No _____ Maybe/Unsure

Would you be interested in doing a PA or sport program for young adult cancer survivors?

_____ Yes _____ No _____ Maybe/Unsure

If you were to have started a PA or sport program, when would you have liked to start?

_____ at the time of diagnosis _____ during treatment
_____ right after treatment _____ 3-6 months after treatment
_____ at least 1 year after treatment

Who would you prefer to do regular PA with?

a) ___ alone ___ other cancer survivors ___ family/friends ___ no preference

Who would you have liked to receive PA information from (please check one)?

_____ oncologist _____ fitness expert from the community
_____ cancer support group _____ fitness expert from a cancer center
_____ physiotherapist at the cancer center
_____ nutritionist from the cancer center
_____ nurse

How would you prefer to receive information about PA or sport (check all that apply)?

_____ brochures/print materials _____ self-help video _____ on the internet
_____ telephone _____ face-to-face _____ by e-mail

Where would you prefer to do a PA or sport program?
_____ outside around my neighborhood _____ at home
_____ at a community fitness center _____ at a cancer center

Would you be interested in a program that would help you increase your PA level?

_____ No _____ Yes _____ Maybe/Unsure

My favorite PA or sport in the winter is:
_____, _____, _____.

My favorite PA or sport in the summer is:
_____, _____, _____.

Do you have exercise equipment in your home?

___ No ___Yes (please list)_____

Do you currently have a fitness center membership?

___ No ___ Yes (where?) _____

Do you have access to the internet? _____ No _____ Yes

Would you have been able and willing to complete this survey on-line?

_____ No _____ Yes

This next set of questions ask you to describe your home and neighborhood. Please circle the best answer that corresponds to you and your neighborhood.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
(1) Many shops, stores, markets or other places to buy things I need are within easy walking distance of my residence	1	2	3	4
(2) My neighborhood has several free or low cost recreation facilities, such as parks, walking trails, bike paths, and recreation centers.	1	2	3	4
(3) There are well-maintained sidewalks on most of the streets in my neighborhood.	1	2	3	4
(4) There are well-maintained pedestrian trails in or near my neighborhood	1	2	3	4
(5) When being active in my neighborhood, there are a lot of exhaust fumes (such as from cars and buses).	1	2	3	4
(6) There are many attractive homes and buildings in my neighborhood.	1	2	3	4
(7) There are many attractive natural sights in my neighborhood (such as landscaping, views…).	1	2	3	4
(8) My neighborhood is generally free from litter.	1	2	3	4
(9) It feels unsafe to walk along the streets in my neighborhood because there is so much traffic.	1	2	3	4
(10) There is a high crime rate in my neighborhood.	1	2	3	4
(11) I have exercise equipment I can use at home.	1	2	3	4
(12) I have appropriate work-out attire (shoes, clothes).	1	2	3	4

This next part of the questionnaire is needed to help understand the medical characteristics of the people participating in the study. For this reason it is very important information. All information is held in strict confidence. Please answer the questions to the best of your knowledge. If you don't know the answer to a question, just circle "don't know" (DK).

1. When were you first diagnosed with cancer (month/year)?_____. DK

2. What type of cancer do you/did you have? _____. DK

3. What was the stage of your cancer at diagnosis (i.e., I,II,III,IV)?_____. DK

4. Was your cancer described as "early" or "more advanced"?

Early More Advanced DK

5. Did your treatment include surgery (please circle)? Yes No

6. Did your treatment include radiation therapy (please circle)? Yes No

7. Did your treatment include chemotherapy (please circle)? Yes No

8. What is the <u>current status</u> of your cancer treatments?

_____ I have completed all my cancer treatments for now.

_____ I am still receiving cancer treatments right now.

9. Have you ever had a recurrence of your cancer? Yes No

10. What is the <u>current status</u> of your cancer?

_____ the doctors have told me that the cancer is gone from my body.

_____ the doctors have told me that I still have some cancer in my body.

11. Did you ever receive psychosocial counselling? Yes No

This next part of the questionnaire is needed to help understand the demographic characteristics of the people participating in the study. For this reason it is very important information. All information is held in strict confidence and its presentation to the public will be group data only.

1. (a) Age: _____ (b) Sex: _____ Male _____ Female

2. Marital Status: Never Married_____ Married _____Common Law _____

Separated _____ Widowed _____ Divorced _____

3. Education (Please check highest level attained):

Some High School _____ Completed High School _____

Some University/College _____ Completed University/College _____

Some Graduate School _____ Completed Graduate School _____

4. Annual Family Income: < 20,000_____ 20-39,999 _____ 40-59,999____
60-79,999_____ 80-99,999 _____ > 100,000____

5. Did your cancer diagnosis cause financial distress?

1	2	3	4	5
No, Not at All	A Little	Somewhat	Quite a lot	Completely

6. Current Employment Status:

Disability _____ Retired _____ Part Time _____
Homemaker _____ Full Time _____ Temporarily Unemployed _____

7. Height _____ Weight _____

8. What is your primary ethnic origin or race (please circle)?

White Black Hispanic Asian Aboriginal Other _____

The next set of questions ask you about your smoking and diet habits and current health. This information is to help us understand other important health issues. Please provide as honest and accurate responses as possible.

1. Which of the following best describes your current smoking?

_____ Never Smoked _____ Ex-Smoker _____ Occasional _____ Regular Smoker (smoke every day)

2. Which of the following best describes your current alcohol consumption?

_____ Never Drink _____ Social Drinker _____ Regular Drinker (drink every day)

3. Has a doctor or nurse ever told you that you had any of the following conditions? (check all that apply):

High blood pressure	_____No _____Yes	High cholesterol	_____No _____Yes
Heart attack	_____No _____Yes	Stroke	_____No _____Yes
Emphysema	_____No _____Yes	Chronic bronchitis	_____No _____Yes
Diabetes	_____No _____Yes	Other cancer	_____No _____Yes
Angina (chest pains)	_____No _____Yes	Arthritis	_____No _____Yes

Any other long term health condition?
_____

4. In the past month, was your ability to participate in physical activity and sport limited by a health condition, injury, or disability <u>related</u> to your cancer diagnosis?

1	2	3	4	5
No, Not at All	A Little	Somewhat	Quite a lot	Completely

5. In the past month, was your ability to participate in physical activity and sport limited by a health condition, injury, or disability <u>not related</u> to your cancer diagnosis?

1	2	3	4	5
No, Not at All	A Little	Somewhat	Quite a lot	Completely

At any time after your diagnosis with cancer, did any one involved in your cancer care or treatment discuss PA with you? Yes No

If yes, who was it? (check all that apply)

_____ cancer doctor (oncologist) _____ nurse _____ physiotherapist

_____nutritionist _____ psychologist _____ family doctor

_____ other: (please list): _____

If yes, what did they say?

_____
_____
_____
_____
_____
_____
_____

Anything else you would like to tell us? In this final section, please feel free to make any comments concerning your health, the questionnaire itself, physical activity and sport, or anything else you think may be helpful to us. All comments are welcome.

Thank you very much for participating in this research. Please place the completed questionnaire in the stamped envelope and return it to us at your earliest convenience.

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Appendix D

Young Adult Cancer Survivor Physical Activity Assessment (TPB)

1. The information and activities in the guidebook address the construct of 'affective attitude'

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

2. The information and activities in the guidebook address the construct of 'instrumental attitude'.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

Young Adult Cancer Survivor Physical Activity Assessment (TPB)

3. The information and activities in the guidebook address the construct of 'subjective norm'.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

4. The information and activities in the guidebook address the construct of 'perceived behavioral control'.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

5. The information and activities in the guidebook help young adult cancer survivors form a strong 'intention'.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

Young Adult Cancer Survivor Physical Activity Assessment (TPB)

6. The information and activities in the guidebook address the construct of 'planning'.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

7. We would now like to get your OVERALL impression of the guidebook, and its grounding within the theory of planned behavior framework. Overall, how well do you feel that this guidebook reflects/represents the theory of planned behavior framework?

- ◯ Poor Representation
- ◯ Fair Representation
- ◯ Good Representation
- ◯ Very good Representation
- ◯ Excellent Representation

8. Comments:

Appendix E

Young Adult Cancer Survivors Physical Activity (Exercise Oncologists)

1. Exercise recommendations/prescription throughout the guidebook are suitable for young adult cancer survivors.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

2. Exercise principles are well described in the guidebook.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

3. The safety and precautions are adequately described in the guidebook.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

Young Adult Cancer Survivors Physical Activity (Exercise Oncologists)

4. Guidebook will help young adult cancer survivors improve their exercise behavior.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

5. Guidebook is appropriate for young adult cancer survivors that have completed cancer treatment(s).

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

6. The example exercise programs described at the back of the book are appropriate for young adult cancer survivors.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

Appendix F

Young Adult Cancer Survivors Physical Activity (YACS)

Organization

1. The cover is attractive

- ◯ Yes
- ◯ No

Comments

2. Cover indicates the core content and intended audience.

- ◯ Yes
- ◯ No

Comments

3. Desired behavior changes are stressed.

- ◯ Yes
- ◯ No

Comments

4. “Need to know” information is stressed.

- ◯ Yes
- ◯ No

Comments

Young Adult Cancer Survivors Physical Activity (YACS)

5. Not more than three or four main points are presented.

- ◯ Yes
- ◯ No

Comments

6. Headers and summaries are used to show organization and provide message repetition.

- ◯ Yes
- ◯ No

Comments

7. A summary that stresses what to do is included.

- ◯ Yes
- ◯ No

Comments

Writing Style

8. The writing is in conversational style, active voice.

- ◯ Yes
- ◯ No

Comments

Young Adult Cancer Survivors Physical Activity (YACS)

9. There is little or no technical jargon.

- ◯ Yes
- ◯ No

Comments

10. The reading level is appropriate.

- ◯ Yes
- ◯ No

Comments

11. Text is vivid and interesting.

- ◯ Yes
- ◯ No

Comments

12. Tone is friendly.

- ◯ Yes
- ◯ No

Comments

Appearance

13. Pages or sections appear uncluttered.

- ◯ Yes
- ◯ No

Comments

14. Ample white spaces.

- ◯ Yes
- ◯ No

Comments

15. Lowercase letters used (capitals used only where grammatically needed).

- ◯ Yes
- ◯ No

Comments

16. There is a high degree of contrast between the print and the paper.

- ◯ Yes
- ◯ No

Comments

17. Print size is at least 12-point, serif type, and no stylized letters.

- ◯ Yes
- ◯ No

Comments

Young Adult Cancer Survivors Physical Activity (YACS)

18. Illustrations are simple – preferably line drawings

- ◯ Yes
- ◯ No

Comments

19. Illustrations serve to amplify the text.

- ◯ Yes
- ◯ No

Comments

Appeal

20. The material is culturally and age appropriate.

- ◯ Yes
- ◯ No

Comments

21. The material closely matches the logic, language, and experience of the intended audience (i.e., young adult cancer survivors).

- ◯ Yes
- ◯ No

Comments

Young Adult Cancer Survivors Physical Activity (YACS)

22. Interaction is invited via questions, responses, suggested action, activities, etc.

- ◯ Yes
- ◯ No

Comments

Other Concerns

23. Guidebook will help young adult cancer survivors improve their exercise behavior.

- ◯ Yes
- ◯ No

Comments

24. Guidebook is appropriate for individuals that have completed treatment(s) for cancers affecting young adults.

- ◯ Yes
- ◯ No

Comments

Demographic Information

***25. Age**

***26. Sex**

- ◯ Male
- ◯ Female

Young Adult Cancer Survivors Physical Activity (YACS)

***27. How long has it been since your last cancer treatment? (number of months)**

***28. What time of cancer did you have?**

***29. Marital Status**

- ◯ Never married
- ◯ Married
- ◯ Common Law
- ◯ Separated
- ◯ Widowed
- ◯ Divorced

30. Education (please check highest level completed)

- ◯ Some high school
- ◯ Completed high school
- ◯ Some University/College
- ◯ Completed University/College
- ◯ Some graduate school
- ◯ Completed graduate school

***31. Employment Status**

- ☐ Student
- ☐ Disability
- ☐ Retired
- ☐ Part-time
- ☐ Homemaker
- ☐ Full time
- ☐ Temporary unemployed

More Feedback

Young Adult Cancer Survivors Physical Activity (YACS)

32. Any other comments or feedback you provide is very helpful:

Appendix G

Young Adult Cancer Survivors Physical Activity (HI)

Organization

1. The cover is attractive

- ◯ Yes
- ◯ No

Other (please specify)

2. Cover indicates the core content and intended audience.

- ◯ Yes
- ◯ No

Other (please specify)

3. Desired behavior changes are stressed.

- ◯ Yes
- ◯ No

Other (please specify)

4. “Need to know” information is stressed.

- ◯ Yes
- ◯ No

Other (please specify)

Young Adult Cancer Survivors Physical Activity (HI)

5. Not more than three or four main points are presented.

- ◯ Yes
- ◯ No

Other (please specify)

6. Headers and summaries are used to show organization and provide message repetition.

- ◯ Yes
- ◯ No

Other (please specify)

7. A summary that stresses what to do is included.

- ◯ Yes
- ◯ No

Other (please specify)

Writing Style

8. The writing is in conversational style, active voice.

- ◯ Yes
- ◯ No

Other (please specify)

Young Adult Cancer Survivors Physical Activity (HI)

9. There is little or no technical jargon.

- ◯ Yes
- ◯ No

Other (please specify)

10. The reading level is appropriate.

- ◯ Yes
- ◯ No

Other (please specify)

11. Text is vivid and interesting.

- ◯ Yes
- ◯ No

Other (please specify)

12. Tone is friendly.

- ◯ Yes
- ◯ No

Other (please specify)

Appearance

Young Adult Cancer Survivors Physical Activity (HI)

13. Pages or sections appear uncluttered.

- ◯ Yes
- ◯ No

Other (please specify)

14. Ample white spaces.

- ◯ Yes
- ◯ No

Other (please specify)

15. Lowercase letters used (capitals used only where grammatically needed).

- ◯ Yes
- ◯ No

Other (please specify)

16. There is a high degree of contrast between the print and the paper.

- ◯ Yes
- ◯ No

Other (please specify)

17. Print size is at least 12-point, serif type, and no stylized letters.

- ◯ Yes
- ◯ No

Other (please specify)

Young Adult Cancer Survivors Physical Activity (HI)

18. Illustrations are simple – preferably line drawings

- ◯ Yes
- ◯ No

Other (please specify)

19. Illustrations serve to amplify the text.

- ◯ Yes
- ◯ No

Other (please specify)

Appeal

20. The material is culturally and age appropriate.

- ◯ Yes
- ◯ No

Other (please specify)

21. The material closely matches the logic, language, and experience of the intended audience (i.e., young adult cancer survivors).

- ◯ Yes
- ◯ No

Other (please specify)

Young Adult Cancer Survivors Physical Activity (HI)

22. Interaction is invited via questions, responses, suggested action, activities, etc.

- ◯ Yes
- ◯ No

Other (please specify)

Comments

23. Any other feedback on the guidebook?

Appendix H

Young Adult Cancer Survivors Physical Activity (Oncologists)

1. Medical information is accurate.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

2. Exercise recommendations throughout the guidebook are safe and suitable for young adult cancer survivors.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

3. The 'safety and precautions' are appropriate for young adult cancer survivors

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

Young Adult Cancer Survivors Physical Activity (Oncologists)

4. Guidebook content is suitable for young adult cancer survivors.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

5. Guidebook will help young adult cancer survivors improve their exercise behavior.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

6. Guidebook is appropriate for young adult cancer survivors that have completed cancer treatment(s)

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Comment

Appendix I

Baseline Survey

Young Adult Cancer and Physical Activity Baseline Survey

***1. The purpose of the study is to test two different physical activity print materials designed to help young adult cancer survivors increase their physical activity levels and improve health. After completing this baseline survey you will receive some physical activity information to your home address. This is a research project being conducted by Dr. Kerry Courneya at the University of Alberta. You are invited to participate in this research project because you are a young adult cancer survivor.**

Your participation in this research study is voluntary. You may choose not to participate. If you decide to participate in this research survey and two follow up surveys, you may withdraw at any time and at your request your previous surveys will be withdrawn. If you decide not to participate in this study or if you withdraw from participating at any time, you will not be penalized.

The procedure involves completing three online surveys (one right now, one in a month and one in three months) that will take approximately 15-30 minutes each. Your responses will be confidential and we do not collect identifying information such as your name, email address or IP address. The survey questions will be about your physical activity, , your health and medical and demographic information. It is important to answer as many questions as possible, however, if you feel uncomfortable answering certain questions just skip them.

Some risk may be associated with participation in this study. If you increase your exercise, it is possible that you may experience muscle soreness, fatigue, or musculoskeletal injuries. To reduce these risks, increase your physical activity slowly. Possible benefits to participating would be increase fitness level, and reduce treatment side effects such as fatigue and to help the design of physical activity written material for young adult cancer survivors.

All information is confidential. All data is stored in a password protected electronic format. To help protect your confidentiality, the surveys will not contain information that will personally identify you. The results of this study will be used for scholarly purposes only, presented as a group and may be shared with University of Alberta representatives.

If you have any questions about the research study, please contact Lisa Belanger, research coordinator 780.492.2829 (call collect if from outside of town) or

Baseline Survey

lisa.belanger@ualberta.ca. This research has been reviewed according to Alberta Health Services REB for research involving human subjects.

If you feel at any time that you have not been informed to your satisfaction about the risks and benefits of this study, or that you have been encouraged to continue in this study after you wanted to withdraw, you can call the the Alberta Health Services Patient Concerns Department toll free number 1-877-753-2170.

ELECTRONIC CONSENT: Please select your choice below.

Clicking on the "agree" button below indicates that:

- **you have ready the above information**
- **you voluntarily agree to participate**
- **you are at least 18 years of age**

If you do not wish to participate in the research study, please decline participation by clicking on the "disagree" button.

◯ agree
◯ disagree

***2. Initials (The first letters of your first, middle and last name)**

***3. Study Identification Number (was sent to you in an email)**

4. In general, would you say your health is:

◯ Excellent ◯ Very good ◯ Good ◯ Fair ◯ Poor

Baseline Survey

5. Compared to one year ago, how would you rate your health in general now?

- ◯ Much better now than one year ago
- ◯ Somewhat better now than one year ago
- ◯ About the same as one year ago
- ◯ Somewhat worse than a one year ago
- ◯ Much worse than a year ago

6. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
Vigorous Activities, such as running, lifting heavy objects, participating in strenuous sports	◯	◯	◯
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	◯	◯	◯
Lifting or carrying groceries	◯	◯	◯
Climbing several flights of stairs	◯	◯	◯
Climbing one flight of stairs	◯	◯	◯
Bending, kneeling, or stooping	◯	◯	◯
Walking more than a mile	◯	◯	◯
Walking several hundred yards	◯	◯	◯
Walking one hundred yards	◯	◯	◯
Bathing or dressing oneself	◯	◯	◯

Baseline Survey

7. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Cut down on the amount of time you spent on work or other activities	◯	◯	◯	◯	◯
Accomplished less than you would like	◯	◯	◯	◯	◯
Were limited in the kind of work or other activities	◯	◯	◯	◯	◯
Had difficultly performing the work or other activities (e.g., it took extra work)	◯	◯	◯	◯	◯

8. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Cut down on the amount of time you spent on work and other activities	◯	◯	◯	◯	◯
Accomplished less than you would like	◯	◯	◯	◯	◯
Did work or other activities less carefully than usual	◯	◯	◯	◯	◯

9. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

◯ Not at all ◯ Slightly ◯ Moderately ◯ Quite a bit ◯ Extremely

10. How much bodily pain have you had during the past 4 weeks?

◯ None ◯ Very mild ◯ Mild ◯ Moderate ◯ Severe ◯ Very severe

11. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

◯ Not at all ◯ A little bit ◯ Moderately ◯ Quite a bit ◯ Extremely

Baseline Survey

12. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give one answer that comes closest to the way you have been feeling.

How much time over the past 4 weeks...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Did you feel full of life?	◯	◯	◯	◯	◯
Have you been very nervous?	◯	◯	◯	◯	◯
How you felt down in the dumps that nothing could cheer you up?	◯	◯	◯	◯	◯
Have you felt calm and peaceful?	◯	◯	◯	◯	◯
Did you have lots of energy?	◯	◯	◯	◯	◯
Have you felt downhearted or depressed?	◯	◯	◯	◯	◯
Did you feel worn out?	◯	◯	◯	◯	◯
Have you been happy?	◯	◯	◯	◯	◯
Did you feel tired?	◯	◯	◯	◯	◯

13. During the past 4 weeks, how much of the time has your physical and emotional problems interfered with your social activities (like visiting friends and relatives, etc.)?

◯ All of the time ◯ Most of the time ◯ Some of the time ◯ A little of the time ◯ None of the time

14. How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
I seem to get sick a little easier than other people	◯	◯	◯	◯	◯
I am as healthy as anybody I know	◯	◯	◯	◯	◯
I expect my health to get worse	◯	◯	◯	◯	◯
My health is excellent	◯	◯	◯	◯	◯

Baseline Survey

15. The questions in this scale ask you about your feelings and thoughts during the last month. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each one fairly quickly.

	never	almost never	sometimes	fairly often	very often
been upset because of something that happened unexpectedly	○	○	○	○	○
felt that you were unable to control the important things in your life	○	○	○	○	○
felt nervous or stressed	○	○	○	○	○
dealt successfully with irritating life hassles	○	○	○	○	○
felt that you were effectively coping with important changes that occur in your life	○	○	○	○	○
felt confident about your ability to handle your personal problems	○	○	○	○	○
felt that things were going your way	○	○	○	○	○
found that you could not cope with all the things that you had to do	○	○	○	○	○
been able to control irritations in your life	○	○	○	○	○
felt you were on top of things	○	○	○	○	○
been angered because of things that happened that were outside of your control	○	○	○	○	○
found yourself thinking about things that you have to accomplish	○	○	○	○	○
been able to control the way you spend your time	○	○	○	○	○
felt difficulties were piling up so high that you could not overcome them	○	○	○	○	○

Baseline Survey

16. The following questions concern the general perceptions that you currently have about yourself. Please select the number that reflects your current view of yourself.

	strongly disagree	disagree	agree	strongly agree
On the whole I am satisfied with myself	◯	◯	◯	◯
At times I think that I am no good at all	◯	◯	◯	◯
I feel that I have a number of good qualities	◯	◯	◯	◯
I am able to do things as well as most people	◯	◯	◯	◯
I feel I do not have much to be proud of	◯	◯	◯	◯
I certainly feel useless at times	◯	◯	◯	◯
I feel that I am a person of worth, at least on an equal plane with others	◯	◯	◯	◯
I wish I could have more respect for myself	◯	◯	◯	◯
All in all, I am inclined to feel that I am a failure	◯	◯	◯	◯
I take a positive attitude toward myself	◯	◯	◯	◯

17. Below is a list of statements concerning how you might have felt or behaved in the past week. Please use the following scale to indicate how often you felt or behaved in these ways in the past week.

	Rarely or none (<1 day)	Some of the time (1-2 days)	Much of the time (3-4 days)	Most or all of the time (5-7 days)
I felt depressed	◯	◯	◯	◯
I felt that everything I did was an effort	◯	◯	◯	◯
My sleep was restless	◯	◯	◯	◯
I was happy	◯	◯	◯	◯
I felt alone	◯	◯	◯	◯
People were unfriendly	◯	◯	◯	◯
I enjoyed life	◯	◯	◯	◯
I felt sad	◯	◯	◯	◯
I felt people disliked me	◯	◯	◯	◯
I could not get "going"	◯	◯	◯	◯

Baseline Survey

IMPORTANT: The next set of questions focus on leisure-time physical activity. Leisure time means activity done in your free time and does not include your work/job or household chores. Physical activity means any activity that results in a substancial increase in energy expenditure (resulting in a noticable increase in heart rate and breathing rate). Examples of physical activity include brisk walking, jogging, cycling, swimming and dancing. Please note that from here on out we will use PA as a short form for physical activity.

For the next questions, we would like you to recall your average weekly participation in leisure time PA during the past month.

When answering the questions please remember:

-only count PA sessions that last longer that 10 minutes in duration
-only count PA that is done in your free time (not occupation or housework)
-note that the main difference between the three categories is the intensity of the endurance (aerobic) exercise
-if you did not do any PA in one of the categories please write in "0"

Considering a typical week (7 days) over the PAST MONTH how many days on average did you do the following kinds of PA and what was the average duration?

***18. VIGOROUS/STRENUOUS EXERCISE (HEART BEATS RAPIDLY, SWEATING) (e.g., running, aerobic classes, cross country skiing, vigorous swimming, vigorous bicycling)**

Times per week

Average duration (minutes)

***19. MODERATE EXERCISE (NOT EXHAUSTING, LIGHT PERSPIRATION) (e.g., fast walking, tennis, easy bicycling, easy swimming, popular and folk dancing)**

Times per week

Average duration (minutes)

***20. LIGHT/MILD EXERCISE (MINIMAL EFFORT, NO PERSPIRATION) (e.g., easy walking, yoga, bowling, lawn bowling, shuffleboard).**

Times per week

Average duration (minutes)

The next few questions will be asking about your strength training habits. When responding to the questions think about an average week over the past month.

Strength training refers to improving muscular strength by gradually increasing the ability to resist force through the use of free weights, machines or your own body weight.

Baseline Survey

***21. In the average week over the past month have you done any strength exercises?**

- ◯ Yes
- ◯ No

22. If yes, what type of exercises did you do? (check all that apply)

- ☐ weight lifting
- ☐ body weight exercises (sit up, push ups, etc)
- ☐ resistance bands
- ☐ circuit training

Other (please specify)

23. How often and for how long did you do strength exercises per week?

times per week

average duration (minutes)

24. What major muscles are you strength training? (check all that apply)

- ☐ legs
- ☐ hips
- ☐ back
- ☐ chest
- ☐ abdomen
- ☐ shoulders
- ☐ arms

The next few questions will ask you about your participation in sports. Again, think of the average week over the past month.

Sports refers to activities where physical skill influences the outcome of a competition such as golf, soccer, bowling, tennis, skiing, etc

25. In an average week over the past month have you participated in any sports?

- ◯ Yes
- ◯ No

Baseline Survey

26. If yes, what type of sport did you play? (check all that apply- if no, please leave blank and continue)

- ☐ golf
- ☐ hockey/ball hockey
- ☐ tennis
- ☐ soccer
- ☐ swimming
- ☐ baseball
- ☐ bowling
- ☐ volleyball
- ☐ water sports

Other (please specify)

For the rest of this survey, we will ask about your regular PA. We define regular PA as moderate intensity PA (e.g., brisk walking)done for at least 150 minutes per week (2.5 hours) OR vigorous intensity PA (e.g., jogging) done for at least 75 minutes per week (1.25 hours).

***27. The following questions ask you to rate how you feel about doing regular PA over the next month. Please pay careful attention to the words at each end of the scale and check the circle that best represents how you feel. Please answer all items.**

I think that for me to participate in regular PA over the next month would be:

	useless/useful	unenjoyable/enjoyable	harmful/beneficial	painful/pleasurable	unimportant/important	boring/fun
Select one answer from each drop-down menu						

***28. I think that if I participated in regular PA over the next month, most people who are important to me would be**

	Disapproving/Approving	discouraging/encouraging	unsupportive/supportive
Select one answer from each drop-down menu			

***29. I think that over the next month, most of the people who are important to me will be:**

extremely inactive	quite inactive	slightly inactive	neutral	slightly active	quite active	extremely active
◯	◯	◯	◯	◯	◯	◯

Baseline Survey

***30. I think that over the next month, most people who are important to me will themselves participate regularly in PA**

○ strongly disagree ○ moderately disagree ○ slightly disagree ○ neutral ○ slightly agree ○ moderately agree ○ strongly agree

***31. I think over the next month, the PA levels of most people who are important to me will be**

○ extremely low ○ quite low ○ slightly low ○ neutral ○ slightly high ○ quite high ○ extremely high

***32. If you were to do regular PA over the next month, do you think you would...**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
lose weight/control your weight	○	○	○	○	○	○	○
feel fit/healthy	○	○	○	○	○	○	○
improve energy	○	○	○	○	○	○	○
improve endurance	○	○	○	○	○	○	○
improve strength	○	○	○	○	○	○	○
have better health	○	○	○	○	○	○	○
be in a better mood	○	○	○	○	○	○	○
feel better	○	○	○	○	○	○	○
reduce stress	○	○	○	○	○	○	○
have a better sleep	○	○	○	○	○	○	○
reduce your chance of cancer coming back	○	○	○	○	○	○	○
reduce your chance of other chronic disease	○	○	○	○	○	○	○
live longer	○	○	○	○	○	○	○

Baseline Survey

***33. If you were to do regular PA over the next month, do you think you would**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
exercise with other people	○	○	○	○	○	○	○
listen to music while exercising	○	○	○	○	○	○	○
do a variety of activities	○	○	○	○	○	○	○
see improvements from exercising	○	○	○	○	○	○	○
socialize/meet new people while exercising	○	○	○	○	○	○	○
exercise in a group	○	○	○	○	○	○	○

***34. If you were really motivated, how confident are you that you could do regular PA over the next month even if...**

	1 not at all confident	2	3 somewhat confident	4	5 quite confident	6	7 completely confident
you were very busy/had limited time	○	○	○	○	○	○	○
you had family responsibilities	○	○	○	○	○	○	○
you had work responsibilities	○	○	○	○	○	○	○
you had no motivation	○	○	○	○	○	○	○
you were tired	○	○	○	○	○	○	○
the weather was bad	○	○	○	○	○	○	○
you had limited or no access to a recreation facility/gym	○	○	○	○	○	○	○

Baseline Survey

***35. How supportive do you think each of the following people would be if you tried to do a regular PA over the next month? (leave blank if you do not have the specific relationships)**

	extremely unsupportive	quite unsupportive	slightly unsupportive	neutral	slightly supportive	quite supportive	extremely supportive
friends	◯	◯	◯	◯	◯	◯	◯
spouse/partner	◯	◯	◯	◯	◯	◯	◯
family members	◯	◯	◯	◯	◯	◯	◯
children	◯	◯	◯	◯	◯	◯	◯
co-workers	◯	◯	◯	◯	◯	◯	◯
parents	◯	◯	◯	◯	◯	◯	◯

***36. How likely do you think it is that each of the following people would engage in PA over the next month? (leave blank if you do not have the specific relationship)**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
friends	◯	◯	◯	◯	◯	◯	◯
spouse/partner	◯	◯	◯	◯	◯	◯	◯
children	◯	◯	◯	◯	◯	◯	◯
family	◯	◯	◯	◯	◯	◯	◯
co-workers	◯	◯	◯	◯	◯	◯	◯
parents	◯	◯	◯	◯	◯	◯	◯
siblings	◯	◯	◯	◯	◯	◯	◯

These next questions ask to rate how likely you feel it is that YOU would be able to participate in regular PA over the next month if you were really motivated. Pay careful attention to the words on each scale. Circle the number that best represents how you feel.

If you were really motivated...

***37. How much control would you have over doing regular PA over the next month?**

◯ 1 very little control ◯ 2 ◯ 3 ◯ 4 Some control ◯ 5 ◯ 6 ◯ 7 complete control

Baseline Survey

***38. Whether or not I engage in regular PA over the next month is completely up to me?**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***39. How much do you feel that engaging in PA over the next month is beyond your control?**

◯ 1 Not at all	◯ 2	◯ 3	◯ 4 somewhat	◯ 5	◯ 6	◯ 7 very much

***40. For me, participating in regular PA over the next month would be...**

◯ extremely difficult	◯ quite difficult	◯ slightly difficult	◯ neither	◯ slightly easy	◯ quite easy	◯ extremely easy

***41. If I wanted to, I could easily engage in regular PA over the next month**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***42. How confident are you that you could do regular PA over the next month**

◯ 1 not confident at all	◯ 2	◯ 3 somewhat confident	◯ 4	◯ 5 quite confident	◯ 6	◯ 7 completely confident

This next set of questions asks you about your motivation and plans to do regular PA over the next month. Pay careful attention to the words at the end of each scale.

***43. Do you intend to do regular PA over the next month?**

◯ 1 no, not really	◯ 2	◯ 3	◯ 4 somewhat intend	◯ 5	◯ 6	◯ 7 strongly intend

***44. How motivated are you to do regular PA over the next month?**

◯ 1 not motivated at all	◯ 2	◯ 3 somewhat motivated	◯ 4	◯ 5 quite motivated	◯ 6	◯ 7 extremely motivated

Baseline Survey

*45. Planning

	1 No plans	2	3	4	5	6	7 Detailed Plans
I have made plans concerning 'when' I am going to engage in PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'where' I am going to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'what' kind of regular PA I am going to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'how' I am going to get to a place to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'who' I am going to be physically active with over the next month	○	○	○	○	○	○	○

This next part of the survey is needed to help understand the medical profile of the people participating in the study. For this reason it is very important information. All information is held in strict confidence. Please answer to the best of your knowledge. If you don't know the answer to a question just write "don't know"

46. When were you first diagnosed with cancer (month/year)?

	Year	Month
Date of diagnosis		

47. What type of cancer did you have?

Other (please specify)

Baseline Survey

48. What stage was your cancer at diagnosis?

- ◯ I
- ◯ II
- ◯ III
- ◯ IV
- ◯ Don't know

49. Was your cancer described as "early" or "more advanced"?

- ◯ Early
- ◯ More advanced
- ◯ Don't know

50. Did your treatment include surgery?

- ◯ Yes
- ◯ No

51. Did your treatment include radiation therapy?

- ◯ Yes
- ◯ No

52. Did your treatment include chemotherapy?

- ◯ Yes
- ◯ No

53. What is the current status of your cancer treatments?

- ◯ I have completed all my cancer treatments for now
- ◯ I am still receiving cancer treatments right now

54. What is the current status of your cancer?

- ◯ the doctors have told me that the cancer is gone
- ◯ the doctors have told me I still have some cancer

55. Did you ever receive psychosocial counseling?

- ◯ Yes
- ◯ No

Baseline Survey

This next part of the survey is needed to help understand the demographic characteristics of the people participating in the study. For this reason it is very important information. All information is held in strict confidence and its presentation to the public will be in group data form.

***56. Age**

***57. Sex**

- ◯ Male
- ◯ Female

58. Marital Status

- ◯ Never married
- ◯ Married
- ◯ Common Law
- ◯ Separated
- ◯ Widowed
- ◯ Divorced

59. Education (Please select highest level attained)

- ◯ Some high school
- ◯ Completed high school
- ◯ Some university/college
- ◯ Completed university/college
- ◯ Some graduate school
- ◯ Completed graduate school

60. Annual Family Income

- ◯ <20,000
- ◯ 20-39,999
- ◯ 40-59,999
- ◯ 60-79,999
- ◯ >100,000

61. Current Employment Status

- ◯ Disability
- ◯ Retired
- ◯ Part Time
- ◯ Full Time
- ◯ Temporarily Unemployed

62. Height

	Feet	Inches
feet, inches		

63. Weight (pounds)

Baseline Survey

64. What is your primary ethic origin or race?

◯ White ◯ Black ◯ Hispanic ◯ Asian ◯ Aboriginal ◯ Other

This next set of questions ask you about your smoking habits and current health. This information is to help us understand any health issues. Please provide as honest and accurate responses as possible.

65. Which of the following best describes your current smoking?

◯ Never smoked ◯ Ex-smoker ◯ Occasional ◯ Regular smoker (smoke everyday)

66. Which of the following best describes your current alcohol consumption?

◯ Never drink
◯ Social drinker
◯ Regular drinker (drink everyday)

67. Has a doctor ever told you that you have any of the following conditions? (select all the apply)

	Yes	No
high blood pressure	◯	◯
heart attack	◯	◯
emphysema	◯	◯
diabetes	◯	◯
angina (chest pain)	◯	◯
high cholesterol	◯	◯
stroke	◯	◯
chronic bronchitis	◯	◯
other cancer	◯	◯
arthritis	◯	◯

68. Any other long term health condition?

69. In the past month, was your ability to participate in PA limited by a health condition, injury, or disability related to your cancer diagnosis?

◯ 1 No, not at all ◯ 2 ◯ 3 Somewhat ◯ 4 ◯ 5 Quite a lot ◯ 6 ◯ 7 Completely

Baseline Survey

70. In the past month, was your ability to participate in PA limited by a health condition, injury, or disability not related to your cancer diagnosis?

◯ 1 No, not at all ◯ 2 ◯ 3 Somewhat ◯ 4 ◯ 5 Quite a lot ◯ 6 ◯ 7 Completely

71. At any time after your cancer diagnosis, did any one involved in your cancer care or treatment discuss PA with you?

◯ Yes

◯ No

72. If yes, who was it? (Check all that apply)

☐ Cancer doctor (oncologist) ☐ nutritionist ☐ other

☐ nurse ☐ psychologist

☐ physiotherapist ☐ family doctor

73. Please provide your mailing address (including your first and last name)

Baseline Survey

74. Anything else you would like to tell us? Please feel free to make any comments concerning your health, the survey, physical activity, or anything else you think may be helpful to us. All comments are welcome.

Thank you very much for participating in this research!

Thank you for completing this survey! After you submit this survey, we will be sending physical activity information to your home address. We ask that you read the information carefully.

We will be contacting you again in a month time via email with another (much shorter) survey, and for the last time in 3 months. If you have any questions or concerns please feel free to contact Lisa Belanger at lisa.belanger@ualberta.ca or 780-938-4644.

Thank you!!!

Appendix J

One Month Survey

Instructions

In this first follow-up survey, we are going to ask you many of the same questions as the first survey. However, it is important to answer these questions based on what you are thinking and feeling RIGHT NOW, and not how you answered the questions last time. This will give us important information about how your thoughts and feelings have changed. Many of these questions are viewed as personal, It is important to answer as many questions as possible, however, if you feel uncomfortable answering certain questions just skip them. All responses are completely confidential and will never be used in a way they can be linked to you. Many of the questions may seem similar but it is important to treat each question separately and provide an answer to each . There are no right or wrong answers and all we ask is that you provide responses that are as honest and accurate as possible. The survey should take approximately 10-15 minutes of your time to complete. If you have any questions about completing the survey, please contact Lisa Belanger at (780) 492-2829 (call collect if you are from outside of town) or lisa.belanger@ualberta.ca.

***1. Initials (The first letters of your first, middle and last name)**

***2. Study Identification Number**

***3. Title of the exercise material you received in the mail?**

IMPORTANT: The next set of questions focus on leisure-time physical activity. Leisure time means activity done in your free time and does not include your work/job or household chores. Physical activity means any activity that results in a substancial increase in energy expenditure (resulting in a noticable increase in heart rate and breathing rate). Examples of physical activity include brisk walking, jogging, cycling, swimming and dancing. Please note that from here on out we will use PA as a short form for physical activity.

For the next question, we would like you to recall your average weekly participation in leisure time PA during the past month.

When answering the questions please remember:

-only count PA sessions that last longer that 10 minutes in duration
-only count PA that is done in your free time (not occupation or housework)
-note that the main difference between the first three categories is the intensity of the endurance (aerobic) exercise
-if you did not do any PA in one of the categories please write in "0"

Considering a typical week (7 days) over the PAST MONTH how many days on average did you do the following kinds of PA and what was the average duration?

***4. VIGOROUS/STRENUOUS EXERCISE (HEART BEATS RAPIDLY, SWEATING) (e.g., running, aerobic classes, cross country skiing, vigorous swimming, vigorous bicycling)**

Times per week

Average duration (minutes)

One Month Survey

***5. MODERATE EXERCISE (NOT EXHAUSTING, LIGHT PERSPIRATION) (e.g., fast walking, tennis, easy bicycling, easy swimming, popular and folk dancing)**

Times per week

Average duration (minutes)

***6. LIGHT/MILD EXERCISE (MINIMAL EFFORT, NO PERSPIRATION) (e.g., easy walking, yoga, bowling, lawn bowling, shuffleboard).**

Times per week

Average duration (minutes)

The next few questions will be asking about your strength training habits. When responding to the questions think about an average week over the past month.

Strength training refers to improving muscular strength by gradually increasing the ability to resist force through the use of free weights, machines or your own body weight.

***7. In the average week over the past month have you done any strength exercises?**

- ◯ Yes
- ◯ No

8. If yes, what type of exercises did you do? (Check all that apply)

- ☐ weight lifting
- ☐ body weight exercises (sit up, push ups, etc)
- ☐ resistance bands
- ☐ circuit training

Other (please specify)

9. How often and for how long did you strengthtrain per week?

times per week

average duration (minutes)

One Month Survey

10. What major muscles are you strength training? (check all that apply)

- [ ] legs
- [ ] hips
- [ ] back
- [ ] chest
- [ ] abdomen
- [ ] shoulders
- [ ] arms

The next few questions will ask you about your participation in sports. Again, think of the average week over the past month.

Sports refers to activities where physical skill influences the outcome of a competition such as golf, soccer, bowling, tennis, skiing, etc

11. SPORTS (activities where physical skill influences the outcome of a competition such as golf, soccer, bowling, tennis, skiing, etc.) In the average week over the past month have you participated in any sports?

- ◯ Yes
- ◯ No

One Month Survey

12. If yes, what type of sport did you play? (check all that apply- if no, please leave blank and continue)

- ☐ golf
- ☐ hockey/ball hockey
- ☐ tennis
- ☐ soccer
- ☐ swimming
- ☐ baseball
- ☐ bowling
- ☐ volleyball
- ☐ water sports
- ☐ other

Other (please specify)

For the rest of this survey, we will ask about your regular PA. We define regular PA as moderate intensity PA (e.g., brisk walking)done for at least 150 minutes per week (2.5 hours) OR vigorous intensity PA (e.g., jogging) done for at least 75 minutes per week (1.25 hours).

***13. The following questions ask you to rate how you feel about doing regular PA over the next month. Please pay careful attention to the words at each end of the scale and check the circle that best represents how you feel. Please answer all items.**

I think that for me to participate in regular PA over the next month would be:

	useless/useful	unenjoyable/enjoyable	harmful/beneficial	painful/pleasurable	unimportant/important	boring/fun
Select one answer from each drop-down menu						

***14. I think that if I participated in regular PA over the next month, most people who are important to me would be**

	Disapproving/Approving	discouraging/encouraging	unsupportive/supportive
Select one answer from each drop-down menu			

One Month Survey

***15. I think that over the next month, most of the people who are important to me will be:**

◯ extremely inactive	◯ quite inactive	◯ slightly inactive	◯ neutral	◯ slightly active	◯ quite active	◯ extremely active

***16. I think that over the next month, most people who are important to me will themselves participate regularly in PA**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***17. I think over the next month, the PA levels of most people who are important to me will be**

◯ extremely low	◯ quite low	◯ slightly low	◯ neutral	◯ slightly high	◯ quite high	◯ extremely high

***18. If you were to do regular PA over the next month, do you think you would...**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
lose weight/control your weight	◯	◯	◯	◯	◯	◯	◯
feel fit/healthy	◯	◯	◯	◯	◯	◯	◯
improve energy	◯	◯	◯	◯	◯	◯	◯
improve endurance	◯	◯	◯	◯	◯	◯	◯
improve strength	◯	◯	◯	◯	◯	◯	◯
have better health	◯	◯	◯	◯	◯	◯	◯
be in a better mood	◯	◯	◯	◯	◯	◯	◯
feel better	◯	◯	◯	◯	◯	◯	◯
reduce stress	◯	◯	◯	◯	◯	◯	◯
have a better sleep	◯	◯	◯	◯	◯	◯	◯
reduce your chance of cancer coming back	◯	◯	◯	◯	◯	◯	◯
reduce your chance of other chronic disease	◯	◯	◯	◯	◯	◯	◯
live longer	◯	◯	◯	◯	◯	◯	◯

One Month Survey

***19. If you were to do regular PA over the next month, do you think you would**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
exercise with other people	○	○	○	○	○	○	○
listen to music while exercising	○	○	○	○	○	○	○
do a variety of activities	○	○	○	○	○	○	○
see improvements from exercising	○	○	○	○	○	○	○
socialize/meet new people while exercising	○	○	○	○	○	○	○
exercise in a group	○	○	○	○	○	○	○

***20. If you were really motivated, how confident are you that you could do regular PA over the next month even if...**

	1 not at all confident	2	3 somewhat confident	4	5 quite confident	6	7 completely confident
you were very busy/had limited time	○	○	○	○	○	○	○
you had family responsibilities	○	○	○	○	○	○	○
you had work responsibilities	○	○	○	○	○	○	○
you had no motivation	○	○	○	○	○	○	○
you were tired	○	○	○	○	○	○	○
the weather was bad	○	○	○	○	○	○	○
you had limited or no access to a recreation facility/gym	○	○	○	○	○	○	○

One Month Survey

***21. How supportive do you think each of the following people would be if you tried to do a regular PA over the next month? (leave blank if you do not have the specific relationships)**

	extremely unsupportive	quite unsupportive	slightly unsupportive	neutral	slightly supportive	quite supportive	extremely supportive
friends	○	○	○	○	○	○	○
spouse/partner	○	○	○	○	○	○	○
family members	○	○	○	○	○	○	○
children	○	○	○	○	○	○	○
co-workers	○	○	○	○	○	○	○
parents	○	○	○	○	○	○	○

***22. How likely do you think it is that each of the following people would engage in PA over the next month? (leave blank if you do not have the specific relationship)**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
friends	○	○	○	○	○	○	○
spouse/partner	○	○	○	○	○	○	○
children	○	○	○	○	○	○	○
family	○	○	○	○	○	○	○
co-workers	○	○	○	○	○	○	○
parents	○	○	○	○	○	○	○
siblings	○	○	○	○	○	○	○

These next questions ask to rate how likely you feel it is that YOU would be able to participate in regular PA over the next month if you were really motivated. Pay careful attention to the words on each scale. Circle the number that best represents how you feel.

If you were really motivated...

***23. How much control would you have over doing regular PA over the next month?**

○ 1 very little control ○ 2 ○ 3 ○ 4 Some control ○ 5 ○ 6 ○ 7 complete control

One Month Survey

***24. Whether or not I engage in regular PA over the next month is completely up to me?**

○ strongly disagree ○ moderately disagree ○ slightly disagree ○ neutral ○ slightly agree ○ moderately agree ○ strongly agree

***25. How much do you feel that engaging in PA over the next month is beyond your control?**

○ 1 Not at all ○ 2 ○ 3 ○ 4 somewhat ○ 5 ○ 6 ○ 7 very much

***26. For me, participating in regular PA over the next month would be...**

○ extremely difficult ○ quite difficult ○ slightly difficult ○ neither ○ slightly easy ○ quite easy ○ extremely easy

***27. If I wanted to, I could easily engage in regular PA over the next month**

○ strongly disagree ○ moderately disagree ○ slightly disagree ○ neutral ○ slightly agree ○ moderately agree ○ strongly agree

***28. How confident are you that you could do regular PA over the next month**

○ 1 not confident at all ○ 2 ○ 3 somewhat confident ○ 4 ○ 5 quite confident ○ 6 ○ 7 completely confident

This next set of questions asks you about your motivation and plans to do regular PA over the next month. Pay careful attention to the words at the end of each scale.

***29. Do you intend to do regular PA over the next month?**

○ 1 no, not really ○ 2 ○ 3 ○ 4 somewhat intend ○ 5 ○ 6 ○ 7 strongly intend

***30. How motivated are you to do regular PA over the next month?**

○ 1 not motivated at all ○ 2 ○ 3 somewhat motivated ○ 4 ○ 5 quite motivated ○ 6 ○ 7 extremely motivated

One Month Survey

***31. Planning**

	1 No plans	2	3	4	5	6	7 Detailed Plans
I have made plans concerning 'when' I am going to engage in PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'where' I am going to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'what' kind of regular PA I am going to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'how' I am going to get to a place to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'who' I am going to be physically active with over the next month	○	○	○	○	○	○	○

This next part of the survey is needed to help understand the demographic characteristics of the people participating in the study. For this reason it is very important information. All information is held in strict confidence and its presentation to the public will be in group data form.

***32. Age**

***33. Sex**

○ Male

○ Female

34. Marital Status

○ Never married

○ Married

○ Common Law

○ Separated

○ Widowed

○ Divorced

One Month Survey

35. Education (Please select highest level attained)

- ◯ Some high school
- ◯ Completed high school
- ◯ Some university/college
- ◯ Completed university/college
- ◯ Some graduate school
- ◯ Completed graduate school

36. Annual Family Income

- ◯ <20,000
- ◯ 20-39,999
- ◯ 40-59,999
- ◯ 60-79,999
- ◯ >100,000

37. Current Employment Status

- ◯ Disability
- ◯ Retired
- ◯ Part Time
- ◯ Full Time
- ◯ Temporarily Unemployed

38. Height (feet, inches)

39. Weight (pounds)

40. What is your primary ethic origin or race?

◯ White ◯ Black ◯ Hispanic ◯ Asian ◯ Aboriginal ◯ Other

One Month Survey

41. Anything else you would like to tell us? Please feel free to make any comments concerning your health, the survey, physical activity, or anything else you think may be helpful to us. All comments are welcome.

Thank you very much for participating in this research!

Appendix K

Three Month Survey (TARG)

Instructions

Thank you for participating in this study. In this FINAL survey we are going to ask you a series of questions about yourself. Many of the questions ask you about your physical health, and some may be viewed as personal. The questions about physical activity, and some demographic information are required. It is important to answer as many questions as possible, however, if you feel uncomfortable answering certain questions just skip them. All responses are completely confidential and will never be used in a way they can be linked to you. Many of the questions may seem similar but it is important to treat each question separately and provide an answer to each . There are no right or wrong answers and all we ask is that you provide responses that are as honest and accurate as possible. The survey should take approximately 30-45 minutes of your time to complete. If you have any questions about completing the survey, please contact Lisa Belanger at (780)492-2829 (call collect if you are from outside of town) or lisa.belanger@ualberta.ca.

***1. Initials (The first letters of your first, middle and last name)**

***2. Study Identification Number**

3. Name of the exercise information you received? (if you don't remember write the amount of pages it was)

4. In general, would you say your health is:

◯ Excellent ◯ Very good ◯ Good ◯ Fair ◯ Poor

5. Compared to one year ago, how would you rate your health in general now?

◯ Much better now than one year ago

◯ Somewhat better now than one year ago

◯ About the same as one year ago

◯ Somewhat worse than a one year ago

◯ Much worse than a year ago

Three Month Survey (TARG)

6. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
Vigorous Activities, such as running, lifting heavy objects, participating in strenuous sports	◯	◯	◯
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	◯	◯	◯
Lifting or carrying groceries	◯	◯	◯
Climbing several flights of stairs	◯	◯	◯
Climbing one flight of stairs	◯	◯	◯
Bending, kneeling, or stooping	◯	◯	◯
Walking more than a mile	◯	◯	◯
Walking several hundred yards	◯	◯	◯
Walking one hundred yards	◯	◯	◯
Bathing or dressing oneself	◯	◯	◯

7. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Cut down on the amount of time you spent on work or other activities	◯	◯	◯	◯	◯
Accomplished less than you would like	◯	◯	◯	◯	◯
Were limited in the kind of work or other activities	◯	◯	◯	◯	◯
Had difficultly performing the work or other activities (e.g., it took extra work)	◯	◯	◯	◯	◯

Three Month Survey (TARG)

8. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Cut down on the amount of time you spent on work and other activities	◯	◯	◯	◯	◯
Accomplished less than you would like	◯	◯	◯	◯	◯
Did work or other activities less carefully than usual	◯	◯	◯	◯	◯

9. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

◯ Not at all ◯ Slightly ◯ Moderately ◯ Quite a bit ◯ Extremely

10. How much bodily pain have you had during the past 4 weeks?

◯ None ◯ Very mild ◯ Mild ◯ Moderate ◯ Severe ◯ Very severe

11. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

◯ Not at all ◯ A little bit ◯ Moderately ◯ Quite a bit ◯ Extremely

Three Month Survey (TARG)

12. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give one answer that comes closest to the way you have been feeling.

How much time over the past 4 weeks...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Did you feel full of life?	◯	◯	◯	◯	◯
Have you been very nervous?	◯	◯	◯	◯	◯
How you felt down in the dumps that nothing could cheer you up?	◯	◯	◯	◯	◯
Have you felt calm and peaceful?	◯	◯	◯	◯	◯
Did you have lots of energy?	◯	◯	◯	◯	◯
Have you felt downhearted or depressed?	◯	◯	◯	◯	◯
Did you feel worn out?	◯	◯	◯	◯	◯
Have you been happy?	◯	◯	◯	◯	◯
Did you feel tired?	◯	◯	◯	◯	◯

13. During the past 4 weeks, how much of the time has your physical and emotional problems interfered with your social activities (like visiting friends and relatives, etc.)?

◯ All of the time ◯ Most of the time ◯ Some of the time ◯ A little of the time ◯ None of the time

14. How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
I seem to get sick a little easier than other people	◯	◯	◯	◯	◯
I am as healthy as anybody I know	◯	◯	◯	◯	◯
I expect my health to get worse	◯	◯	◯	◯	◯
My health is excellent	◯	◯	◯	◯	◯

Three Month Survey (TARG)

15. The questions in this scale ask you about your feelings and thoughts during the last month. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each one fairly quickly.

	never	almost never	sometimes	fairly often	very often
been upset because of something that happened unexpectedly	○	○	○	○	○
felt that you were unable to control the important things in your life	○	○	○	○	○
felt nervous or stressed	○	○	○	○	○
dealt successfully with irritating life hassles	○	○	○	○	○
felt that you were effectively coping with important changes that occur in your life	○	○	○	○	○
felt confident about your ability to handle your personal problems	○	○	○	○	○
felt that things were going your way	○	○	○	○	○
found that you could not cope with all the things that you had to do	○	○	○	○	○
been able to control irritations in your life	○	○	○	○	○
felt you were on top of things	○	○	○	○	○
been angered because of things that happened that were outside of your control	○	○	○	○	○
found yourself thinking about things that you have to accomplish	○	○	○	○	○
been able to control the way you spend your time	○	○	○	○	○
felt difficulties were piling up so high that you could not overcome them	○	○	○	○	○

Three Month Survey (TARG)

16. The following questions concern the general perceptions that you currently have about yourself. Please select the number that reflects your current view of yourself.

	strongly disagree	disagree	agree	strongly agree
On the whole I am satisfied with myself	◯	◯	◯	◯
At times I think that I am no good at all	◯	◯	◯	◯
I feel that I have a number of good qualities	◯	◯	◯	◯
I am able to do things as well as most people	◯	◯	◯	◯
I feel I do not have much to be proud of	◯	◯	◯	◯
I certainly feel useless at times	◯	◯	◯	◯
I feel that I am a person of worth, at least on an equal plane with others	◯	◯	◯	◯
I wish I could have more respect for myself	◯	◯	◯	◯
All in all, I am inclined to feel that I am a failure	◯	◯	◯	◯
I take a positive attitude toward myself	◯	◯	◯	◯

17. Below is a list of statements concerning how you might have felt or behaved in the past week. Please use the following scale to indicate how often you felt or behaved in these ways in the past week.

	Rarely or none (<1 day)	Some of the time (1-2 days)	Much of the time (3-4 days)	Most or all of the time (5-7 days)
I felt depressed	◯	◯	◯	◯
I felt that everything I did was an effort	◯	◯	◯	◯
My sleep was restless	◯	◯	◯	◯
I was happy	◯	◯	◯	◯
I felt alone	◯	◯	◯	◯
People were unfriendly	◯	◯	◯	◯
I enjoyed life	◯	◯	◯	◯
I felt sad	◯	◯	◯	◯
I felt people disliked me	◯	◯	◯	◯
I could not get "going"	◯	◯	◯	◯

Three Month Survey (TARG)

IMPORTANT: The next set of questions focus on leisure-time physical activity. Leisure time means activity done in your free time and does not include your work/job or household chores. Physical activity means any activity that results in a substancial increase in energy expenditure (resulting in a noticable increase in heart rate and breathing rate). Examples of physical activity include brisk walking, jogging, cycling, swimming and dancing. Please note that from here on out we will use PA as a short form for physical activity.

For the next question, we would like you to recall your average weekly participation in leisure time PA during the past month.

When answering the questions please remember:

-only count PA sessions that last longer that 10 minutes in duration
-only count PA that is done in your free time (not occupation or housework)
-note that the main difference between the three categories is the intensity of the endurance (aerobic) exercise
-if you did not do any PA in one of the categories please write in "0"

Considering a typical week (7 days) over the PAST MONTH how many days on average did you do the following kinds of PA and what was the average duration?

***18. VIGOROUS/STRENUOUS EXERCISE (HEART BEATS RAPIDLY, SWEATING) (e.g., running, aerobic classes, cross country skiing, vigorous swimming, vigorous bicycling)**

Times per week

Average duration (minutes)

***19. MODERATE EXERCISE (NOT EXHAUSTING, LIGHT PERSPIRATION) (e.g., fast walking, tennis, easy bicycling, easy swimming, popular and folk dancing)**

Times per week

Average duration (minutes)

***20. LIGHT/MILD EXERCISE (MINIMAL EFFORT, NO PERSPIRATION) (e.g., easy walking, yoga, bowling, lawn bowling, shuffleboard).**

Times per week

Average duration (minutes)

The next few questions will be asking about your strength training habits. When responding to the questions think about an average week over the past month.

Strength training refers to improving muscular strength by gradually increasing the ability to resist force through the use of free weights, machines or your own body weight.

Three Month Survey (TARG)

***21. In the average week over the past month have you done any strength exercises?**

- ◯ Yes
- ◯ No

22. If yes, what type of exercises did you do? (check all that apply)

- ☐ weight lifting
- ☐ body weight exercises (sit up, push ups, etc)
- ☐ resistance bands
- ☐ circuit training

Other (please specify)

23. How often and for how long did you strength train per week?

times per week

average duration (minutes)

24. What major muscles are you strength training? (check all that apply)

- ☐ legs
- ☐ hips
- ☐ back
- ☐ chest
- ☐ abdomen
- ☐ shoulders
- ☐ arms

The next few questions will ask you about your participation in sports. Again, think of the average week over the past month.

Sports refers to activities where physical skill influences the outcome of a competition such as golf, soccer, bowling, tennis, skiing, etc

25. In an average week over the past month have you participated in any sports?

- ◯ Yes
- ◯ No

Three Month Survey (TARG)

26. If yes, what type of sport did you play? (check all that apply- if no, leave blank and continue)

- ☐ golf
- ☐ hockey/ball hockey
- ☐ tennis
- ☐ soccer
- ☐ swimming
- ☐ baseball
- ☐ bowling
- ☐ volleyball
- ☐ water sports

Other (please specify)

For the rest of this survey, we will ask about your regular PA. We define regular PA as moderate intensity PA (e.g., brisk walking)done for at least 150 minutes per week (2.5 hours) OR vigorous intensity PA (e.g., jogging) done for at least 75 minutes per week (1.25 hours).

***27. The following questions ask you to rate how you feel about doing regular PA over the next month. Please pay careful attention to the words at each end of the scale and check the circle that best represents how you feel. Please answer all items.**

I think that for me to participate in regular PA over the next month would be:

	useless/useful	unenjoyable/enjoyable	harmful/beneficial	painful/pleasurable	unimportant/important	boring/fun
Select one answer from each drop-down menu						

***28. I think that if I participated in regular PA over the next month, most people who are important to me would be**

	Disapproving/Approving	discouraging/encouraging	unsupportive/supportive
Select one answer from each drop-down menu			

***29. I think that over the next month, most of the people who are important to me will be:**

◯ extremely inactive	◯ quite inactive	◯ slightly inactive	◯ neutral	◯ slightly active	◯ quite active	◯ extremely active

Three Month Survey (TARG)

***30. I think that over the next month, most people who are important to me will themselves participate regularly in PA**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***31. I think over the next month, the PA levels of most people who are important to me will be**

◯ extremely low	◯ quite low	◯ slightly low	◯ neutral	◯ slightly high	◯ quite high	◯ extremely high

***32. If you were to do regular PA over the next month, do you think you would...**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
lose weight/control your weight	◯	◯	◯	◯	◯	◯	◯
feel fit/healthy	◯	◯	◯	◯	◯	◯	◯
improve energy	◯	◯	◯	◯	◯	◯	◯
improve endurance	◯	◯	◯	◯	◯	◯	◯
improve strength	◯	◯	◯	◯	◯	◯	◯
have better health	◯	◯	◯	◯	◯	◯	◯
be in a better mood	◯	◯	◯	◯	◯	◯	◯
feel better	◯	◯	◯	◯	◯	◯	◯
reduce stress	◯	◯	◯	◯	◯	◯	◯
have a better sleep	◯	◯	◯	◯	◯	◯	◯
reduce your chance of cancer coming back	◯	◯	◯	◯	◯	◯	◯
reduce your chance of other chronic disease	◯	◯	◯	◯	◯	◯	◯
live longer	◯	◯	◯	◯	◯	◯	◯

Three Month Survey (TARG)

***33. If you were to do regular PA over the next month, do you think you would**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
exercise with other people	○	○	○	○	○	○	○
listen to music while exercising	○	○	○	○	○	○	○
do a variety of activities	○	○	○	○	○	○	○
see improvements from exercising	○	○	○	○	○	○	○
socialize/meet new people while exercising	○	○	○	○	○	○	○
exercise in a group	○	○	○	○	○	○	○

***34. If you were really motivated, how confident are you that you could do regular PA over the next month even if...**

	1 not at all confident	2	3 somewhat confident	4	5 quite confident	6	7 completely confident
you were very busy/had limited time	○	○	○	○	○	○	○
you had family responsibilities	○	○	○	○	○	○	○
you had work responsibilities	○	○	○	○	○	○	○
you had no motivation	○	○	○	○	○	○	○
you were tired	○	○	○	○	○	○	○
the weather was bad	○	○	○	○	○	○	○
you had limited or no access to a recreation facility/gym	○	○	○	○	○	○	○

Three Month Survey (TARG)

***35. How supportive do you think each of the following people would be if you tried to do a regular PA over the next month? (leave blank if you do not have the specific relationships)**

	extremely unsupportive	quite unsupportive	slightly unsupportive	neutral	slightly supportive	quite supportive	extremely supportive
friends	◯	◯	◯	◯	◯	◯	◯
spouse/partner	◯	◯	◯	◯	◯	◯	◯
family members	◯	◯	◯	◯	◯	◯	◯
children	◯	◯	◯	◯	◯	◯	◯
co-workers	◯	◯	◯	◯	◯	◯	◯
parents	◯	◯	◯	◯	◯	◯	◯

***36. How likely do you think it is that each of the following people would engage in PA over the next month? (leave blank if you do not have the specific relationship)**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
friends	◯	◯	◯	◯	◯	◯	◯
spouse/partner	◯	◯	◯	◯	◯	◯	◯
children	◯	◯	◯	◯	◯	◯	◯
family	◯	◯	◯	◯	◯	◯	◯
co-workers	◯	◯	◯	◯	◯	◯	◯
parents	◯	◯	◯	◯	◯	◯	◯
siblings	◯	◯	◯	◯	◯	◯	◯

These next questions ask to rate how likely you feel it is that YOU would be able to participate in regular PA over the next month if you were really motivated. Pay careful attention to the words on each scale. Circle the number that best represents how you feel.

If you were really motivated...

***37. How much control would you have over doing regular PA over the next month?**

◯ 1 very little control ◯ 2 ◯ 3 ◯ 4 Some control ◯ 5 ◯ 6 ◯ 7 complete control

Three Month Survey (TARG)

***38. Whether or not I engage in regular PA over the next month is completely up to me?**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***39. How much do you feel that engaging in PA over the next month is beyond your control?**

◯ 1 Not at all	◯ 2	◯ 3	◯ 4 somewhat	◯ 5	◯ 6	◯ 7 very much

***40. For me, participating in regular PA over the next month would be...**

◯ extremely difficult	◯ quite difficult	◯ slightly difficult	◯ neither	◯ slightly easy	◯ quite easy	◯ extremely easy

***41. If I wanted to, I could easily engage in regular PA over the next month**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***42. How confident are you that you could do regular PA over the next month**

◯ 1 not confident at all	◯ 2	◯ 3 somewhat confident	◯ 4	◯ 5 quite confident	◯ 6	◯ 7 completely confident

This next set of questions asks you about your motivation and plans to do regular PA over the next month. Pay careful attention to the words at the end of each scale.

***43. Do you intend to do regular PA over the next month?**

◯ 1 no, not really	◯ 2	◯ 3	◯ 4 somewhat intend	◯ 5	◯ 6	◯ 7 strongly intend

***44. How motivated are you to do regular PA over the next month?**

◯ 1 not motivated at all	◯ 2	◯ 3 somewhat motivated	◯ 4	◯ 5 quite motivated	◯ 6	◯ 7 extremely motivated

Three Month Survey (TARG)

***45. Planning**

	1 No plans	2	3	4	5	6	7 Detailed Plans
I have made plans concerning 'when' I am going to engage in PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'where' I am going to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'what' kind of regular PA I am going to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'how' I am going to get to a place to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'who' I am going to be physically active with over the next month	○	○	○	○	○	○	○

The following questions are related to the physical activity information that we sent you 3 months ago. There are no right or wrong answers and all we ask is that you provide responses that you provide responses that are as honest and accurate as possible.

46. Did you read the physical activity information we sent you?

- ○ No, did not read it at all
- ○ Yes, read them quickly
- ○ Yes, read them in detail

Three Month Survey (TARG)

47. How often have you read the physical activity information over the last month?

- ◯ Never
- ◯ Just the once
- ◯ Once, selected sections more
- ◯ Several Times
- ◯ 2-3 times a week
- ◯ almost everyday

48. Did you find the physical activity information easy to understand?

◯ extremely difficult to understand | ◯ quite difficult to understand | ◯ somewhat difficult to understand | ◯ neutral | ◯ somewhat easy to understand | ◯ quite easy to understand | ◯ extremely easy to understand

49. Did you find the physical activity information informative?

◯ extremely uninformative | ◯ quite uninformative | ◯ slightly uninformative | ◯ neutral | ◯ slightly informative | ◯ quite informative | ◯ extremely informative

50. Did you find the physical activity information helpful in increasing you physical activity level?

◯ extremely unhelpful | ◯ slightly unhelpful | ◯ somewhat unhelpful | ◯ neutral | ◯ sightly helpful | ◯ quite helpful | ◯ extremely helpful

51. How did you find the length of the guidebook?

◯ extremely short | ◯ quite short | ◯ slightly short | ◯ just right | ◯ slightly long | ◯ quite long | ◯ extremely long

52. What information or chapter did you find the most useful?

53. What information or chapter did you find the least useful?

Three Month Survey (TARG)

54. This next set of questions are about the guidebook you received three months ago.

	Yes	No
The cover is attractive	◯	◯
Cover indicates the core content and the intended audience	◯	◯
Desired behavior changes are stressed	◯	◯
"Need to know" information is stressed	◯	◯
Not more than three or four main points are presented	◯	◯
Headers and summaries are used to show organization and provide message repetition	◯	◯
A summary that stresses what to do is included	◯	◯
The writing is in conversational style, active voice.	◯	◯
There is little or no technical jargon	◯	◯
The reading level is appropriate	◯	◯
Text is vivid and interesting	◯	◯
Tone is friendly	◯	◯
Pages or sections are uncluttered	◯	◯
Ample white spaces	◯	◯
Lowercase letters are used (capitals only where grammatically needed)	◯	◯
There is a high degree of contrast between the print and paper	◯	◯
Print size is at least 12-point, serif type, and no stylized letters	◯	◯
Illustrations are simple	◯	◯
Illustrations amplify text	◯	◯
The materials are culturally and age appropriate	◯	◯
The material closely matches the logic, language, and experience of intended audience (young adult cancer survivors)	◯	◯
Interaction is invited via questions, responses, suggested action, activities etc.	◯	◯

Three Month Survey (TARG)

55. Anything else you would like to tell us? Please feel free to make any comments concerning your health, the survey, physical activity, or anything else you think may be helpful to us. All comments are welcome.

Thank you very much for participating in this research!

Appendix L

Three Month Survey (CPAG)

Instructions

Thank you for participating in this study. In this FINAL survey we are going to ask you a series of questions about yourself. Many of the questions ask you about your physical health, and some may be viewed as personal. The questions about physical activity, and some demographic information are required. It is important to answer as many questions as possible, however, if you feel uncomfortable answering certain questions just skip them. All responses are completely confidential and will never be used in a way they can be linked to you. Many of the questions may seem similar but it is important to treat each question separately and provide an answer to each . There are no right or wrong answers and all we ask is that you provide responses that are as honest and accurate as possible. The survey should take approximately 30-45 minutes of your time to complete. If you have any questions about completing the survey, please contact Lisa Belanger at (780)492-2829 (call collect if you are from outside of town) or lisa.belanger@ualberta.ca.

***1. Initials (The first letters of your first, middle and last name)**

***2. Study Identification Number**

***3. Name of the exercise information you received? (if you don't remember write the amount of pages it was)**

4. In general, would you say your health is:

◯ Excellent ◯ Very good ◯ Good ◯ Fair ◯ Poor

5. Compared to one year ago, how would you rate your health in general now?

◯ Much better now than one year ago

◯ Somewhat better now than one year ago

◯ About the same as one year ago

◯ Somewhat worse than a one year ago

◯ Much worse than a year ago

Three Month Survey (CPAG)

6. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
Vigorous Activities, such as running, lifting heavy objects, participating in strenuous sports	◯	◯	◯
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	◯	◯	◯
Lifting or carrying groceries	◯	◯	◯
Climbing several flights of stairs	◯	◯	◯
Climbing one flight of stairs	◯	◯	◯
Bending, kneeling, or stooping	◯	◯	◯
Walking more than a mile	◯	◯	◯
Walking several hundred yards	◯	◯	◯
Walking one hundred yards	◯	◯	◯
Bathing or dressing oneself	◯	◯	◯

7. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Cut down on the amount of time you spent on work or other activities	◯	◯	◯	◯	◯
Accomplished less than you would like	◯	◯	◯	◯	◯
Were limited in the kind of work or other activities	◯	◯	◯	◯	◯
Had difficultly performing the work or other activities (e.g., it took extra work)	◯	◯	◯	◯	◯

Three Month Survey (CPAG)

8. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Cut down on the amount of time you spent on work and other activities	◯	◯	◯	◯	◯
Accomplished less than you would like	◯	◯	◯	◯	◯
Did work or other activities less carefully than usual	◯	◯	◯	◯	◯

9. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

◯ Not at all ◯ Slightly ◯ Moderately ◯ Quite a bit ◯ Extremely

10. How much bodily pain have you had during the past 4 weeks?

◯ None ◯ Very mild ◯ Mild ◯ Moderate ◯ Severe ◯ Very severe

11. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

◯ Not at all ◯ A little bit ◯ Moderately ◯ Quite a bit ◯ Extremely

Three Month Survey (CPAG)

12. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give one answer that comes closest to the way you have been feeling.

How much time over the past 4 weeks...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Did you feel full of life?	◯	◯	◯	◯	◯
Have you been very nervous?	◯	◯	◯	◯	◯
How you felt down in the dumps that nothing could cheer you up?	◯	◯	◯	◯	◯
Have you felt calm and peaceful?	◯	◯	◯	◯	◯
Did you have lots of energy?	◯	◯	◯	◯	◯
Have you felt downhearted or depressed?	◯	◯	◯	◯	◯
Did you feel worn out?	◯	◯	◯	◯	◯
Have you been happy?	◯	◯	◯	◯	◯
Did you feel tired?	◯	◯	◯	◯	◯

13. During the past 4 weeks, how much of the time has your physical and emotional problems interfered with your social activities (like visiting friends and relatives, etc.)?

◯ All of the time ◯ Most of the time ◯ Some of the time ◯ A little of the time ◯ None of the time

14. How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
I seem to get sick a little easier than other people	◯	◯	◯	◯	◯
I am as healthy as anybody I know	◯	◯	◯	◯	◯
I expect my health to get worse	◯	◯	◯	◯	◯
My health is excellent	◯	◯	◯	◯	◯

Three Month Survey (CPAG)

15. The questions in this scale ask you about your feelings and thoughts during the last month. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each one fairly quickly.

	never	almost never	sometimes	fairly often	very often
been upset because of something that happened unexpectedly	○	○	○	○	○
felt that you were unable to control the important things in your life	○	○	○	○	○
felt nervous or stressed	○	○	○	○	○
dealt successfully with irritating life hassles	○	○	○	○	○
felt that you were effectively coping with important changes that occur in your life	○	○	○	○	○
felt confident about your ability to handle your personal problems	○	○	○	○	○
felt that things were going your way	○	○	○	○	○
found that you could not cope with all the things that you had to do	○	○	○	○	○
been able to control irritations in your life	○	○	○	○	○
felt you were on top of things	○	○	○	○	○
been angered because of things that happened that were outside of your control	○	○	○	○	○
found yourself thinking about things that you have to accomplish	○	○	○	○	○
been able to control the way you spend your time	○	○	○	○	○
felt difficulties were piling up so high that you could not overcome them	○	○	○	○	○

Three Month Survey (CPAG)

16. The following questions concern the general perceptions that you currently have about yourself. Please select the number that reflects your current view of yourself.

	strongly disagree	disagree	agree	strongly agree
On the whole I am satisfied with myself	◯	◯	◯	◯
At times I think that I am no good at all	◯	◯	◯	◯
I feel that I have a number of good qualities	◯	◯	◯	◯
I am able to do things as well as most people	◯	◯	◯	◯
I feel I do not have much to be proud of	◯	◯	◯	◯
I certainly feel useless at times	◯	◯	◯	◯
I feel that I am a person of worth, at least on an equal plane with others	◯	◯	◯	◯
I wish I could have more respect for myself	◯	◯	◯	◯
All in all, I am inclined to feel that I am a failure	◯	◯	◯	◯
I take a positive attitude toward myself	◯	◯	◯	◯

17. Below is a list of statements concerning how you might have felt or behaved in the past week. Please use the following scale to indicate how often you felt or behaved in these ways in the past week.

	Rarely or none (<1 day)	Some of the time (1-2 days)	Much of the time (3-4 days)	Most or all of the time (5-7 days)
I felt depressed	◯	◯	◯	◯
I felt that everything I did was an effort	◯	◯	◯	◯
My sleep was restless	◯	◯	◯	◯
I was happy	◯	◯	◯	◯
I felt alone	◯	◯	◯	◯
People were unfriendly	◯	◯	◯	◯
I enjoyed life	◯	◯	◯	◯
I felt sad	◯	◯	◯	◯
I felt people disliked me	◯	◯	◯	◯
I could not get "going"	◯	◯	◯	◯

Three Month Survey (CPAG)

IMPORTANT: The next set of questions focus on leisure-time physical activity. Leisure time means activity done in your free time and does not include your work/job or household chores. Physical activity means any activity that results in a substancial increase in energy expenditure (resulting in a noticable increase in heart rate and breathing rate). Examples of physical activity include brisk walking, jogging, cycling, swimming and dancing. Please note that from here on out we will use PA as a short form for physical activity.

For the next question, we would like you to recall your average weekly participation in leisure time PA during the past month.

When answering the questions please remember:

-only count PA sessions that last longer that 10 minutes in duration
-only count PA that is done in your free time (not occupation or housework)
-note that the main difference between the three categories is the intensity of the endurance (aerobic) exercise
-if you did not do any PA in one of the categories please write in "0"

Considering a typical week (7 days) over the PAST MONTH how many days on average did you do the following kinds of PA and what was the average duration?

***18. VIGOROUS/STRENUOUS EXERCISE (HEART BEATS RAPIDLY, SWEATING) (e.g., running, aerobic classes, cross country skiing, vigorous swimming, vigorous bicycling)**

Times per week

Average duration (minutes)

***19. MODERATE EXERCISE (NOT EXHAUSTING, LIGHT PERSPIRATION) (e.g., fast walking, tennis, easy bicycling, easy swimming, popular and folk dancing)**

Times per week

Average duration (minutes)

***20. LIGHT/MILD EXERCISE (MINIMAL EFFORT, NO PERSPIRATION) (e.g., easy walking, yoga, bowling, lawn bowling, shuffleboard).**

Times per week

Average duration (minutes)

The next few questions will be asking about your strength training habits. When responding to the questions think about an average week over the past month.

Strength training refers to improving muscular strength by gradually increasing the ability to resist force through the use of free weights, machines or your own body weight.

Three Month Survey (CPAG)

***21. In the average week over the past month have you done any strength exercises?**

- ◯ Yes
- ◯ No

22. If yes, what type of exercises did you do? (check all that apply)

- ☐ weight lifting
- ☐ body weight exercises (sit up, push ups, etc)
- ☐ resistance bands
- ☐ circuit training

Other (please specify)

23. How often and for how long did you strength train per week?

times per week

average duration (minutes)

24. What major muscles are you strength training? (check all that apply)

- ☐ legs
- ☐ hips
- ☐ back
- ☐ chest
- ☐ abdomen
- ☐ shoulders
- ☐ arms

The next few questions will ask you about your participation in sports. Again, think of the average week over the past month.

Sports refers to activities where physical skill influences the outcome of a competition such as golf, soccer, bowling, tennis, skiing, etc.

25. In an average week over the past month have you participated in any sports?

- ◯ Yes
- ◯ No

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26. If yes, what type of sport did you play? (check all that apply- if no, leave blank and continue)

- [ ] golf
- [ ] hockey/ball hockey
- [ ] tennis
- [ ] soccer
- [ ] swimming
- [ ] baseball
- [ ] bowling
- [ ] volleyball
- [ ] water sports
- [ ] other

Other (please specify)

For the rest of this survey, we will ask about your regular PA. We define regular PA as moderate intensity PA (e.g., brisk walking)done for at least 150 minutes per week (2.5 hours) OR vigorous intensity PA (e.g., jogging) done for at least 75 minutes per week (1.25 hours).

***27. The following questions ask you to rate how you feel about doing regular PA over the next month. Please pay careful attention to the words at each end of the scale and check the circle that best represents how you feel. Please answer all items.**

I think that for me to participate in regular PA over the next month would be:

	useless/useful	unenjoyable/enjoyable	harmful/beneficial	painful/pleasurable	unimportant/important	boring/fun
Select one answer from each drop-down menu						

***28. I think that if I participated in regular PA over the next month, most people who are important to me would be**

	Disapproving/Approving	discouraging/encouraging	unsupportive/supportive
Select one answer from each drop-down menu			

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***29. I think that over the next month, most of the people who are important to me will be:**

◯ extremely inactive	◯ quite inactive	◯ slightly inactive	◯ neutral	◯ slightly active	◯ quite active	◯ extremely active

***30. I think that over the next month, most people who are important to me will themselves participate regularly in PA**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***31. I think over the next month, the PA levels of most people who are important to me will be**

◯ extremely low	◯ quite low	◯ slightly low	◯ neutral	◯ slightly high	◯ quite high	◯ extremely high

***32. If you were to do regular PA over the next month, do you think you would...**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
lose weight/control your weight	◯	◯	◯	◯	◯	◯	◯
feel fit/healthy	◯	◯	◯	◯	◯	◯	◯
improve energy	◯	◯	◯	◯	◯	◯	◯
improve endurance	◯	◯	◯	◯	◯	◯	◯
improve strength	◯	◯	◯	◯	◯	◯	◯
have better health	◯	◯	◯	◯	◯	◯	◯
be in a better mood	◯	◯	◯	◯	◯	◯	◯
feel better	◯	◯	◯	◯	◯	◯	◯
reduce stress	◯	◯	◯	◯	◯	◯	◯
have a better sleep	◯	◯	◯	◯	◯	◯	◯
reduce your chance of cancer coming back	◯	◯	◯	◯	◯	◯	◯
reduce your chance of other chronic disease	◯	◯	◯	◯	◯	◯	◯
live longer	◯	◯	◯	◯	◯	◯	◯

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***33. If you were to do regular PA over the next month, do you think you would**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
exercise with other people	◯	◯	◯	◯	◯	◯	◯
listen to music while exercising	◯	◯	◯	◯	◯	◯	◯
do a variety of activities	◯	◯	◯	◯	◯	◯	◯
see improvements from exercising	◯	◯	◯	◯	◯	◯	◯
socialize/meet new people while exercising	◯	◯	◯	◯	◯	◯	◯
exercise in a group	◯	◯	◯	◯	◯	◯	◯

***34. If you were really motivated, how confident are you that you could do regular PA over the next month even if...**

	1 not at all confident	2	3 somewhat confident	4	5 quite confident	6	7 completely confident
you were very busy/had limited time	◯	◯	◯	◯	◯	◯	◯
you had family responsibilities	◯	◯	◯	◯	◯	◯	◯
you had work responsibilities	◯	◯	◯	◯	◯	◯	◯
you had no motivation	◯	◯	◯	◯	◯	◯	◯
you were tired	◯	◯	◯	◯	◯	◯	◯
the weather was bad	◯	◯	◯	◯	◯	◯	◯
you had limited or no access to a recreation facility/gym	◯	◯	◯	◯	◯	◯	◯

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***35. How supportive do you think each of the following people would be if you tried to do a regular PA over the next month? (leave blank if you do not have the specific relationships)**

	extremely unsupportive	quite unsupportive	slightly unsupportive	neutral	slightly supportive	quite supportive	extremely supportive
friends	◯	◯	◯	◯	◯	◯	◯
spouse/partner	◯	◯	◯	◯	◯	◯	◯
family members	◯	◯	◯	◯	◯	◯	◯
children	◯	◯	◯	◯	◯	◯	◯
co-workers	◯	◯	◯	◯	◯	◯	◯
parents	◯	◯	◯	◯	◯	◯	◯

***36. How likely do you think it is that each of the following people would engage in PA over the next month? (leave blank if you do not have the specific relationship)**

	extremely unlikely	quite unlikely	slightly unlikely	neutral	slightly likely	quite likely	extremely likely
friends	◯	◯	◯	◯	◯	◯	◯
spouse/partner	◯	◯	◯	◯	◯	◯	◯
children	◯	◯	◯	◯	◯	◯	◯
family	◯	◯	◯	◯	◯	◯	◯
co-workers	◯	◯	◯	◯	◯	◯	◯
parents	◯	◯	◯	◯	◯	◯	◯
siblings	◯	◯	◯	◯	◯	◯	◯

These next questions ask to rate how likely you feel it is that YOU would be able to participate in regular PA over the next month if you were really motivated. Pay careful attention to the words on each scale. Circle the number that best represents how you feel.

If you were really motivated...

***37. How much control would you have over doing regular PA over the next month?**

◯ 1 very little control ◯ 2 ◯ 3 ◯ 4 Some control ◯ 5 ◯ 6 ◯ 7 complete control

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***38. Whether or not I engage in regular PA over the next month is completely up to me?**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***39. How much do you feel that engaging in PA over the next month is beyond your control?**

◯ 1 Not at all	◯ 2	◯ 3	◯ 4 somewhat	◯ 5	◯ 6	◯ 7 very much

***40. For me, participating in regular PA over the next month would be...**

◯ extremely difficult	◯ quite difficult	◯ slightly difficult	◯ neither	◯ slightly easy	◯ quite easy	◯ extremely easy

***41. If I wanted to, I could easily engage in regular PA over the next month**

◯ strongly disagree	◯ moderately disagree	◯ slightly disagree	◯ neutral	◯ slightly agree	◯ moderately agree	◯ strongly agree

***42. How confident are you that you could do regular PA over the next month**

◯ 1 not confident at all	◯ 2	◯ 3 somewhat confident	◯ 4	◯ 5 quite confident	◯ 6	◯ 7 completely confident

This next set of questions asks you about your motivation and plans to do regular PA over the next month. Pay careful attention to the words at the end of each scale.

***43. Do you intend to do regular PA over the next month?**

◯ 1 no, not really	◯ 2	◯ 3	◯ 4 somewhat intend	◯ 5	◯ 6	◯ 7 strongly intend

***44. How motivated are you to do regular PA over the next month?**

◯ 1 not motivated at all	◯ 2	◯ 3 somewhat motivated	◯ 4	◯ 5 quite motivated	◯ 6	◯ 7 extremely motivated

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***45. Planning**

	1 No plans	2	3	4	5	6	7 Detailed Plans
I have made plans concerning 'when' I am going to engage in PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'where' I am going to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'what' kind of regular PA I am going to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'how' I am going to get to a place to engage in regular PA over the next month	○	○	○	○	○	○	○
I have made plans concerning 'who' I am going to be physically active with over the next month	○	○	○	○	○	○	○

The following questions are related to the physical activity information that we sent you 3 months ago. There are no right or wrong answers and all we ask is that you provide responses that you provide responses that are as honest and accurate as possible.

46. Did you read the physical activity information we sent you?

- ○ No, did not read it at all
- ○ Yes, read them quickly
- ○ Yes, read them in detail

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47. How often have you read the physical activity information over the last month?

- ◯ Never
- ◯ Just the once
- ◯ Once, selected sections more
- ◯ Several Times
- ◯ 2-3 times a week
- ◯ almost everyday

48. Did you find the physical activity information easy to understand?

◯ extremely difficult to understand	◯ quite difficult to understand	◯ somewhat difficult to understand	◯ neutral	◯ somewhat easy to understand	◯ quite easy to understand	◯ extremely easy to understand

49. Did you find the physical activity information informative?

◯ extremely uninformative	◯ quite uninformative	◯ slightly uninformative	◯ neutral	◯ slightly informative	◯ quite informative	◯ extremely informative

50. Did you find the physical activity information helpful in increasing you physical activity level?

◯ extremely unhelpful	◯ slightly unhelpful	◯ somewhat unhelpful	◯ neutral	◯ sightly helpful	◯ quite helpful	◯ extremely helpful

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51. Anything else you would like to tell us? Please feel free to make any comments concerning your health, the survey, physical activity, or anything else you think may be helpful to us. All comments are welcome.

Thank you very much for participating in this research!