PHYSICAL ACTIVITY AND GYNAECOLOGIC CANCER IN NOVA SCOTIA

by

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DEDICATION

I dedicate this thesis to my dad who taught me so much during his time with us.

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Abstract

Objectives: The purpose of this study was threefold: 1) to explore the physical activity (PA) levels of gynaecologic cancer survivors; 2) to explore the associations between PA and quality of life (QOL); 3) to examine the level of agreement between self-reported and objectively measured PA; and 4) to identify PA preferences.

Methods: In Phase I, 900 gynaecologic cancer survivors were mailed a questionnaire measuring PA, QOL, and various PA preferences. In Phase II, 20 survivors wore an accelerometer for nine consecutive days, completed a questionnaire, and participated in a 20 minute semi-structured interview.

Results: Approximately 30% of participants met the public health PA guidelines, with survivors meeting the PA guidelines reporting higher scores on physical well-being. Over 66% of participants were/may be interested in a PA program. The level of agreement between self-reported and objectively measured PA was poor.

Conclusions: This research demonstrates the importance of PA for cancer survivors.

List of Abbreviations Used

PA	physical activity
PACC	physical activity and cancer control
QOL	quality of life
ACS	American Cancer Society
ACSM	American College of Sports Medicine
SCT	Social Cognitive Theory
SDT	Self-Determination Theory
TTM	Transtheoretical Model
TPB	Theory of Planned Behaviour
NSCR	Nova Scotia Cancer Registry
CCNS	Cancer Care Nova Scotia
HRM	Halifax Regional Municipality
LSI	Leisure Score Index
IPAQ	International Physical Activity Questionnaire
MVPA	moderate-to-vigorous physical activity
SF12	Short Form Health Survey
FACT-G	Functional Assessment of Cancer Therapy General
PCS	physical component summary
MCS	mental component summary
PWB	physical wellbeing
FWB	functional wellbeing
EWB	emotional wellbeing
SWB	social wellbeing
FACT-G	total well-being
ANOVA	analysis of variance
ANCOVA	analysis of covariance
CS	completely sedentary
BG	insufficiently active
MG	meeting guidelines

EG	exceeding guidelines

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Chapter 1: Introduction

In 2012 an estimated 88, 800 new cases of cancer were expected to be diagnosed in women in Canada. While breast cancer continues to be the most common cancer affecting women, gynaecologic cancer diagnoses are also prominent with an estimated 9,250 new gynaecologic cancer cases in 2012 (Canadian Cancer Society Steering Committee [CCSSC], 2012).

The development of new and improved screening techniques and therapeutic modalities has resulted in improved cancer survival. However, a diagnosis of cancer, its treatment-related side-effects, and associated late effects can often have negative implications on the physiological and psychological well-being, and overall quality of life (QOL) of affected individuals (Canadian Cancer Society [CCS], 2013b; Schmitz et al., 2010). Consequently, as the number of survivors continues to grow, so too does the importance of ensuring an optimal QOL. One particular intervention which has been shown to have positive implications on the overall health and well-being of cancer survivors is physical activity (PA).

Courneya and Friedenreich (2007) proposed the Physical Activity and Cancer Control framework (PACC), in which they identify eight potential functions that PA may have along the cancer continuum. Within this framework, PA is suggested to play an important role in cancer prevention (Courneya & Friedenreich, 2007; Cust, 2011; Emaus & Thune, 2011; Leitzmann, 2011; Lynch, Neilson, & Friedenreich, 2011; Monnikhof et al., 2007; Wolin & Tuchman, 2011; Yi Pan & Morrison, 2011), coping, rehabilitation, and health promotion (Courneya et al., 2005a; Jones et al., 2004; Karvinen, Courneya, North, & Venner, 2007b; Lynch, Cerin, Owen, & Aitken, 2007; Stevinson et al., 2007), palliative care (Lowe, 2011), and overall survival (Battaglini, 2011; Carmichael, Daley, Rea, & Bowden, 2010; Galvao, Taafee, Spry, & Newton, 2011; Gil & von Gruenigen, 2011; Jones, 2011; Meyerhardt et al., 2006a, 2006b; Schmitz, 2011; Sellar & Courneya, 2011). Regrettably, despite the documented benefits of PA participation for cancer survivors, the number of cancer survivors reported to be meeting the recommended 30 to 60 minutes of moderate-to-vigorous PA per day, at least five days a week, is low (i.e., Haskell et al., 2007; Karvinen et al., 2006; Karvinen , Courneya, Venner, & North,

2007c; Speck, Courneya, Masse, Duval & Schmitz, 2010; Stevinson et al., 2009a; Vallance, Courneya, Jones, & Reiman, 2006).

Given the documented benefits of PA for cancer survivors there is an urgent need to provide opportunities which facilitate and/or encourage increased PA. Although research examining the relationship between PA and QOL in breast cancer survivors is considerable (Courneya & Friedenreich, 1998; Chen et al., 2009; Kendall, Mahue-Giangreco, Carpenter, Ganz, & Bernstein, 2005; Mandelblatt et al., 2011; Milne, Gordon, Guilfoyle, Wallman, & Courneya, 2007; Valenti et al., 2008; Vallance, Lavallee, Culos-Reed, & Trudeau, 2011), much less research has focused on examining PA behaviours and associated QOL outcomes of gynaecologic survivors leaving a significant gap in our understanding of this particular group. As such, there is a need to expand the literature pertaining to this unique and underserved population of women affected by gynaecological cancers.

While there is a growing body of evidence pointing to the benefits of PA for cancer survivors a significant and ongoing limitation of the current literature is the reliance on self-report PA measures and lack of objectively measured PA. While pragmatic, this reliance has resulted in a gap in the literature. Specifically there is a lack of understanding of the measure of agreement between subjective and objective measures of PA and its association with QOL for cancer survivors. This is problematic as research within the general population has found PA data obtained from self-report and objective measures to be inconsistent, finding objective measurements to be lower than what was self-reported (Colley et al., 2011). Although self-report instruments are attractive due to their capacity to gather data on large samples, while also being inexpensive and easy to administer, their reliance on subjective interpretations of PA, in addition to requiring memory recall from the participants, can often lead to inaccurate findings (Dishman, Washburn, & Schoeller, 2001; Jacobs, Ainsworth, Hartman, & Leon, 1993; Janz, 2006; Sallis & Saelens, 2000; Shephard, 2003).

Finally, a key component to the success of future PA programs is to ensure they target the specific needs and interests of cancer survivor groups (Trinh, Plotnikoff, Rhodes, North & Courneya, 2011b). Many studies have focused on gathering cancer survivors' preferences for a PA program (Belanger, Plotnikoff, Clark & Courneya, 2011;

Demark-Wahnefried et al., 2000; Gjserset et al., 2011a; Jones & Courneya, 2002; Jones et al., 2007; Karvinen et al., 2006, 2007c; Murnane, Geary & Milne, 2012; Rogers et al., 2009c; Rogers, Markwell, Verhulst, McAuley & Courneya, 2009b; Stevinson et al., 2009a; Trinh et al., 2011b; Vallance et al., 2006). Interestingly, a large number of cancer survivors report having an interest in a PA program, however this is not reflected in the current levels of PA. Basic information, such as interests and preferences, are keys to the success of interventions aimed at increasing PA in cancer survivors. Unfortunately previous work has relied on closed-item questions to gather information about cancer survivors' PA preferences. While this method is a useful starting point, it is lacking in its ability to gain an in depth understanding of the needs and wants of cancer survivors, and the reasoning behind these. Incorporating open-ended discussions into this area of research is needed. Providing open-ended opportunities for cancer survivors to discuss their PA needs and interests will likely elicit useful information that can be used to aid in increasing PA levels in cancer survivors.

1.1 Research Objectives and Hypotheses

1.1.1 Objectives.

- To explore the current levels of PA in gynaecologic cancer survivors based on both self-reported and objective PA measures
- To explore the relationship between self-reported and objectively measured PA and QOL in gynaecologic cancer survivors
- To explore the relationship between self-reported and objectively measured PA
- To explore the PA interests and preferences of gynaecologic cancer survivors in Nova Scotia.

Cancer is a condition which touches the lives of many, affecting an estimated 186,400 new individuals in Canada each year (CCSSC, 2012). As research continues to contribute to the development of improved screening and treatment techniques, long-term survivorship and QOL is becoming increasingly important (Ellison & Wilkins, 2010). As research continues to highlight the importance of a physically active lifestyle for cancer survivors, there needs to be confirmation that the consistently used self-report measures provide reliable evidence from which the design and implementation of programs and

interventions are developed. The objective measures employed within this study, and the comparison with the commonly employed self-report, will provide a 'check' of the current evidence produced up to this point. It will ensure that our efforts are being directed at thresholds which 'actually' produce improvements in the individuals QOL. Additionally, the further exploration of survivors' interest and preferences for PA programs will provide important information for the development of PA programs for gynaecologic cancer survivors. The proposed study is essential to the development of effective PA and lifestyle programs aimed at improving the QOL of cancer survivors affected by gynaecologic cancer.

1.1.2 Hypotheses.

1. The number of gynaecologic cancer survivors in Nova Scotia meeting public guidelines will be low (approximately 20 to 30 %)
2. Gynaecologic cancer survivors in Nova Scotia who engage in higher levels of PA as measured by self-report and/or objective measures will report higher QOL
3. It is anticipated that cancer survivors self-reported PA will be lower than objectively measured PA levels

Chapter 2: Literature Review

2.1 Gynaecologic Cancer in Canada: An Overview

As the Canadian population continues to grow and age, the number of newly diagnosed cancer cases and mortality due to cancer has steadily increased (CCSSC, 2012). In 2012, an estimated 186,400 new cancer diagnoses were expected in Canada; with 88,800 of those cases being diagnosed in women (CCSSC, 2012). While breast cancer continues to be the most commonly diagnosed cancer among Canadian women (CCSSC, 2012), cancers affecting the female reproductive system (cervical, ovarian, uterine, vaginal, and vulvar) are not far behind with an estimated 9,250 new cases of gynaecologic cancer diagnosed in Canada in 2012 (CCSSC, 2012).

2.1.1 Ovarian Cancer.

Ovarian cancer is the most serious of the gynaecological cancers, with an estimated 2,600 new diagnoses in Canada each year, and approximately 1,750 resulting deaths (CCSSC, 2012; Ovarian Cancer Canada [OCC], 2013). Known as the 'silent killer' (Hartman, Loprinzi, & Gostout, 2005; Sun, Ramirez, & Bodurka, 2007), ovarian cancer in its early stages is often associated with mild or vague symptoms, frequently leading to late stage diagnosis and a poor prognosis (CCS, 2013a; OCC, 2013).

There are multiple types of ovarian cancer, including epithelial, germ cell and stromal, each differing in terms of the types of cells the cancer materializes (CCS, 2013a, 2013d; OCC, 2013). The most common, accounting for 90% of all tumours, is epithelial ovarian cancer which starts in the cells that cover the outer surface of the ovary (CCS, 2013a).

Although the specific aetiology for ovarian cancer remains unknown, several risk factors have been associated with the development of ovarian cancer. These include: age, personal or family history of cancer, hormone-replacement therapy, and genetic mutations (CCS, 2013d; OCC, 2013).

2.1.2 Uterine Cancer.

Uterine cancer is the most common gynaecologic cancer affecting an estimated 5,300 Canadian women in 2012 (CCSSC, 2012; Hartman et al., 2005). This disease is most frequently seen in post-menopausal women between the ages of 40 and 70 years of

age (CCS, 2013c) with ninety-five percent of all uterine cancers originating within the endometrium, the inner lining of the uterus.

Exposure to estrogen has been proposed to be the main factor increasing a woman's risk of developing uterine cancer as it is thought to stimulate cell growth and accumulation known as endometrial hyperplasia, a precancerous condition which can progress into endometrial cancer (CCS, 2013c; Hartman et al., 2005). Increased exposure to estrogen can result from the use of hormone replacement therapy, obesity, and may also be affected by the age of both menarche and menopause, pregnancy history, and irregular ovulation (CCS, 2013c; Hartman et al., 2005). In addition, a variety of other risk factors have been associated with the development of endometrial cancer such as the use of Tamoxifen (used to treat breast cancer), pelvic radiation, diabetes, and the hereditary condition nonpolyposis colon cancer. A family history of uterine cancer in a first degree relative has also been identified as a possible risk factor (CCS, 2013c).

While a Papanicolaou or PAP smear/test can detect some uterine cancers, no effective screening option is available for the early detection of uterine cancer. However, in contrast to ovarian cancer which often produces vague symptoms, endometrial cancer is frequently associated with abnormal vaginal bleeding and/or discharge, as well as pain in the pelvic region typically prompting women to see a physician (CCS, 2013c; Hartman et al., 2005) and potentially facilitating early detection.

2.1.3 Cervical Cancer.

Cervical cancer is a disease of the lower portion of the uterus known as the cervix (CCS, 2013b) and was estimated to affect 1,350 women in 2012 (CCSSC, 2012). Certain strains of the human papillomavirus (HPV 16, 18, 31, 33, 35, and 45) have been identified as the most important risk factors associated with cervical cancer as they can stimulate changes to the cells of the cervix (CCS, 2013b; Hartman et al., 2005). As a result, sexually active women, particularly those whom engage in sexually activity at an early age, are at increased risk of cervical cancers due to their increased chance of being infected by HPV. In addition smoking, a weakened immune system, women of lower socioeconomic status and exposure to Diethylstilbestrol have been identified as risk factors for cervical cancer (CCS, 2013c; Hartman et al., 2005). Family history of cervical

cancer and the use of oral contraceptives have also been identified as possible risk factors (CCS, 2013c).

Similar to endometrial cancer, cancer of the cervix is associated with abnormal vaginal bleeding and discharge, and pain during sexual intercourse. These symptoms however, often do not present themselves until the later stages of the disease (CCS, 2013c; Hartman et al., 2005). Fortunately, sexually active women or women 18 years and older in Canada are recommended to receive regular PAP smears, which can detect abnormal cells in the cervix permitting early detection and treatment thus improving the chances of a better prognosis.

2.2 Quality of Life

QOL is commonly conceptualized as a subjective, multidimensional construct of well-being (Arriba, Fader, Frasure, & von Gruenigen, 2010; Cella & Tulsky, 1990, 1993; Esrek, Ferrell, Dow, & Melancon, 1997; Ferrell, Hassey-Dow, & Grant, 1995; Knobf, Musanti, & Dorward, 2007). A variety of factors have been identified to affect our well-being such as our physical and mental health, social relationships, and the environment. Within cancer research, factor analyses have suggested four primary domains which comprise QOL: physical, functional, emotional, and social/family well-being (Basen-Engquist et al., 2001; Cella et al., 1993; Cella & Tulsky, 1990, 1993). Physical well-being concerns an individual's perceived/observed bodily function. Functional well-being pertains to one's ability to perform daily activities. Emotional well-being consists of psychological functioning (i.e., mood) and social well-being relates ones' to personal social relationships (i.e., friends, family, colleagues).

2.2.1 Quality of Life & Cancer.

QOL is an important concept to explore in relation to cancer, as it can be disrupted anywhere along the cancer trajectory (i.e., pre-diagnosis, treatment, recovery; Saxton & Delay, 2010).QOL can be disturbed both pre and post diagnosis due to signs and symptoms associated with a cancer diagnosis (CCS, 2013a; OCC, 2013), and also as a result of surgeries and/or treatments associated with a therapeutic regimen (i.e., surgery, radiation, chemotherapy; Arriba et al., 2010; CCS, 2013a; OCC, 2013). Research has also shown that the chronic and late effects of the disease and its treatments can also impair/diminish the QOL of survivors (Courneya, 2009; Courneya & Friedenreich,

1999). Some of the commonly reported symptoms and side effects of a cancer diagnosis and/or its treatments include muscular atrophy (Courneya & Friedenreich, 1999, 2001; Courneya, Mackey, & Jones, 2000b; Mustian et al., 2009), lowered aerobic capacity (Courneya et al., 2000b; Courneya & Friedenreich, 2001), pain (Brown et al., 2003; Courneya, 2003; Courneya et al., 2000b; Courneya & Friedenreich, 1999; Mustian et al., 2009), fatigue (Brown et al., 2003; Courneya, 2003; Courneya et al., 2000b; Courneya & Friedenreich, 2001; Mustian et al., 2009), nausea (Brown et al., 2003; Courneya, 2003; Courneya & Friedenreich, 1999, 2001; Mustian et al., 2009); depression (Courneya & Friedenreich, 1999, 2001; Courneya et al., 2000b; Mustian et al, 2009), and anxiety (Courneya & Friedenreich, 1999, 2001; Courneya et al., 2000b). Each symptom and/or side effect ultimately contributes to a decrease in QOL (Courneya & Friedenreich, 1999, 2001; Mustian et al., 2009).

2.2.2 Quality of Life & Gynaecologic Cancer.

The symptoms and side-effects associated with a diagnosis of gynaecologic cancer, and the effects of the often aggressive treatment regimens, are not only distressing but have consistently been shown to negatively affect QOL (Ahlberg, Ekman, & Gaston-Johansson, 2005; Anderson, 1995; Anderson & Lutgendorf, 2000; Arriba et al., 2010; Audette & Waterman, 2010; Bifulco et al., 2011; CCS, 2013a, 2013b; Carter et al., 2010; Chan et al., 2001; Chase, Monk, Wenzel, & Tewari, 2008; Davidson, 2010; Erekson, Sung, DiSilvestro, & Myers, 2009; Esrek et al., 1997; Goncalves, 2010; Greimel, Winter, Kapp, & Haas, 2009; Greimel, Theil, Peininger, Cegar, & Pongatz, 2002; Herzog & Wright, 2007; Janda et al., 2010; Lockwood-Rayerman, 2006; Nout et al., 2009; OCC, 2013; Pearman, 2003; Pignanta, Ballatori, Favalli, & Scambia, 2001; Rannestad, Skjeldstad, Platou, & Hagen, 2008; Reis, Beji, & Coskun, 2010; Suzuki et al., 2011; Vaz et al., 2007, 2011a, 2011b; Vistad, Fossa, & Dahl, 2006). For example, gynaecologic cancer survivors may experience weight changes, pain, fatigue, psychological distress – each shown to have a negative influence on QOL (Abbott-Anderson & Kwekkeboom, 2011; Anderson & Lutgendorf, 2000; Chase et al., 2008; Fernandes & Kimura, 2010).

Unfortunately research evidence shows that a large majority of gynaecologic cancer survivors experience some form of side effect. A prospective longitudinal study of 107 women with endometrial and cervical cancer found 94% of the women to report

being affected by some form of radiotherapy reaction (Vaz et al., 2008), and almost half of a sample of 117 cervical and endometrial cancer survivors who underwent radiation therapy reporting chronic enteritis (Abayomi, Kirwan, & Hackett, 2009), a condition affecting the QOL of those affected (Abayomi, Kirwan, Hackett, & Bagnall, 2005; National Cancer Institute, n.d.). As a result, it is not surprising to find gynaecological cancer survivors reporting lower QOL scores than healthy controls (Greimel et al., 2002; Ozaras & Ozyurda, 2010; von Gruenigen et al., 2010), and for women on active treatment to report poorer QOL than those not on treatment (Bodurka-Bevers et al., 2000; Ferrell et al., 2005). However, the prevalence and severity of these negative side effects is worrisome for this particular group of women. Greimel and colleagues (2002), for example, found gynaecologic cancer patients (endometrial, ovarian and cervical) to be significantly more physically impaired post-treatment compared to women with breast cancer (Greimel et al., 2002). Similarly, a more recent study of women with advanced ovarian cancer that were currently on treatment, found them to have a lower QOL score across all QOL domains compared to females with non-gynaecological cancers (von Gruenigen et al., 2010).

Despite substantial improvements in therapeutic regimes, the lingering effects of a cancer diagnosis and its associated treatment(s) have been found to contribute to long-term disruptions in QOL (Basen-Enquist & Bodurka, 2007; Bradley, Rose, Lutgendorf, Costanzo & Anderson, 2006; Chan et al., 2001; Greimel et al., 2002; Goncalves, 2010; Hodgkinson et al., 2007; Korfage et al., 2008; Li, Samsioe, & Losif, 1999; Pearman, 2003; Vaz et al., 2011a, 2011b). For instance, in a longitudinal study by Chan and colleagues (2001), gynaecological cancer survivors were found to experience psychological and social effects of the disease up to 6 months post treatment (Chan et al., 2001). Such late effects have also been documented in studies with gynaecologic survivors ranging from 3-20 years post-treatment, with women continuing to present with anxiety and depression, some of which met criteria for posttraumatic stress disorder (Bradley et al., 2006; Hodgkinson et al., 2007). In another study, endometrial cancer survivors, 5-7 years post-diagnosis, were found to report greater somatic symptoms and psychological issues compared to post-menopausal healthy controls (Li et al., 1999).

Fortunately, research has documented improvements of symptoms and QOL in long-term survivors from gynaecologic cancer (Becker et al., 2011; Bradley et al., 2006; Carter et al., 2010; Eisemann & Lalos, 1999; Goncalves, 2010; Greimel et al., 2002; Hodgkinson et al., 2007; Pearman, 2003; Rannestad et al., 2008; Reis et al., 2010; Van de Poll-Franse, 2007; Vaz et al., 2008, 2011a, 2011b) some of which have found the QOL of long-term survivors to match that of healthy age matched controls (Rannestad et al., 2008). These QOL improvements however have not been demonstrated within the physical domain making interventions aimed at improving physical well-being a valuable avenue to target.

Optimistically, improved prognosis, due to early detection and improved surgical and treatment techniques, is resulting in increased survival from cancer (Ellison & Wilkins, 2010; Stevinson et al., 2007). Subsequently, healthy lifestyle choices and QOL during survivorship, pre-diagnosis through to end of life, has become an extremely important and popular topic for investigations. One particular intervention which is receiving increased attention is PA.

2.3 Physical Activity & Cancer

PA is conceptualized as "any bodily movement produced by skeletal muscles that require energy expenditure" (World Health Organization [WHO], 2013). The importance of a physically active lifestyle for the general population is well documented. PA can provide physical and psychological benefits, reduce the risk of occurrence of several diseases (i.e., cardiovascular, hypertension, diabetes, obesity, etc) and enhance an individuals' overall well-being (WHO, 2013). PA has also been shown to be equally as (or perhaps more) important for diseased populations, including cancer survivors.

Courneya and Friedenreich (2007) proposed an organizational framework entitled PACC to highlight the importance of PA across the cancer continuum from pre-diagnosis through to post-diagnosis. In particular, PA is identified to have eight cancer controlling outcomes at different points along the cancer trajectory including: prevention, detection, buffering, coping, rehabilitation, health promotion, palliation, and survival.

2.3.1 Physical Activity & Cancer Prevention.

To date, much of the PA and cancer literature has focused on PA as a means of primary cancer prevention (Winzer, Whiteman, Reeves, & Paratz, 2011). The strongest

evidence has been established for colon cancer prevention (Courneya & Friedenreich, 2001; Friedenreich, Neilson, & Lynch, 2010; Friedenreich & Orenstein, 2002). A recent meta-analysis by Wolin
and colleagues (2009) documented a risk reduction of approximately 24% when comparing the most and least active individuals, a reduction in risk that is comparable between males and females. Increased levels of PA are suggested to increase colon motility, thus reducing exposure of carcinogens to the colon (Slattery, 2004).

PA has also been identified to provide 'convincing' evidence for protecting against breast cancer (Friedenreich & Orenstein, 2002). In a recent review of the literature by Lynch and colleagues (2011), a statistically significant reduction in the risk for breast cancer was reported when comparing the most versus least active women. This finding corresponds with an earlier systematic review, which found a reduction in breast cancer risk between 15 and 20 %, particularly in postmenopausal women (Monnikhof et al., 2007). Importantly, a dose-response relationship has been documented to exist, with a reduction of risk increasing with greater amounts (Lynch et al., 2011; Monnikhof et al., 2007) and higher intensity of PA (Lynch et al., 2011).

Meta-analysis, systematic reviews, and reviews of the literature also suggest PA to have a role in the protection against gynaecologic cancer (Cust, 2011), specifically for endometrial (Arem et al., 2011; Cust, Armstrong, Friedenreich, Slimani, & Bauman, 2007; Voskuil et al., 2007) and ovarian cancers (Moorman, Jones, Akushevich, & Schildkraut, 2011; Olsen et al., 2007; Rossing, Cushing-Haugen, Wicklund, Doherty, & Weiss, 2010). While the exact mechanisms are not clear, PA is suggested to influence the levels of biologically available estrogens (i.e., decreased number of ovulation cycles, adiposity) and increase circulating levels of sex hormone binding proteins, thus reducing the risk of these cancers (Cust, 2011). The evidence pertaining to the role of PA in the prevention of cervical cancer is not as strong as infection (HPV) has been causally linked to cervical cancer. However, Cust (2011) reviewed evidence suggesting that PA may have a role in modifying cervical cancer risk also through hormonal and immune factors.

2.3.2 Physical Activity & Cancer Survivorship.

Symptoms and Side-effects.

Although research provides evidence for a link between PA and reduced cancer risk, as the number of survivors continues to grow, a shift in focus on survivorship and health promotion during survivorship is becoming ever more prominent (Burnham & Wilcox, 2002; Campo et al., 2011; Courneya, 2003; Ellison & Wilkins, 2010). Based on 2004-2006 estimates, the 5-year survival of Canadians diagnosed with cancer is predicted to be 62% of that of the general population (Ellison & Wilkins, 2010).

PA has been found to be associated with a reduced the risk of mortality from breast and colorectal cancer (Chen et al, 2011; Holmes, Chen, Feskanich, Kroenke, & Colditz, 2005; Kampman, Vrieling, van Duijnhoven, & Winkels, 2012; Meyerhardt et al., 2006a), with limited evidence established for other cancer sites. However, while improved survival itself is important, research focus has shifted to also understand and improve various outcomes (i.e., QOL) that are relevant during survivorship. Based on Courneya and Friedenreich's (2007) PACC framework, PA is suggested to provide buffering and coping effects during treatment and rehabilitation benefits after treatment. In particular, research has shown that many of the detrimental side effects and chronic effects associated with cancer and its treatments appear to be amenable to improvement with regular PA (Brown et al., 2010; Courneya, 1999, 2003; Courneya et al., 2000b; Courneya & Friedenreich, 1999; Conn, Hafdahl, Porock, McDaniel, & Nielsen, 2006; Cramp & Daniel, 2009; Knobf et al., 2007; Knols, Aaronson, Uebelhart, Fransen, & Aufdemkampe, 2005; Loprinizi & Cardina, 2011; Mustian et al., 2009: Schmitz et al., 2010; Spence, Heesch, & Brown, 2010). Mustian and colleagues (2009) identified PA as a promising strategy to mitigate some of the acute and chronic effects of cancer including: cancer-related fatigue, physical effects (i.e., muscular atrophy) and psychosocial side-effects (i.e., depression, sleep disruption, anxiety). Similarly, a more recent systematic review of 10 studies, focusing on the rehabilitation or post-treatment period, identified both aerobic and resistance exercise to provide an array of benefits including improvements in fatigue, physical function, strength, and body composition for cancer survivors (Spence et al., 2010). These positive implications have been corroborated with findings from a more methodologically rigorous systematic review and meta-analysis of 82 controlled PA trials (Speck et al., 2010), which updated evidence from a previous meta-analysis from 2005 (Schmitz et al., 2005). This meta-analysis found

PA to have positive implications for cancer survivors across 60 outcomes. In particular, PA interventions during treatment produced significant improvements in aerobic fitness, upper and lower body strength, body weight and fat percentage, mood, anxiety and self-esteem. In comparison, post-treatment trials produced large positive effects in upper and lower body strength, and also produced small to moderate effects in aerobic fitness, body weight and fat percentage, mood, fatigue and general symptoms and side effects. In line with this meta-analysis, meta-analyses focused on specific health outcomes have found exercise to have positive effects on cancer-related fatigue (Brown et al., 2010) and depressive symptoms (Craft, Vaniterson, Helenowski, Rademaker, & Courneya, 2012) for cancer survivors. Reviews and meta-analyses focusing on specific cancer sites, although fewer in number, have produced similar findings (Granger, McDonald, Berney, & Denehy, 2011; Loprinzi & Cardinal, 2011).Overall, PA continues to be found to improve aerobic capacity, strength, body composition, in addition to reducing fatigue and emotional distress (Schmitz et al., 2010; Pekmezi & Demark-Wahnefried, 2011).

2.3.3 Physical Activity & Quality of Life.

While these physical and psychological improvements can contribute indirectly to an improved QOL, PA interventions which have included QOL as a primary outcome measure have shown QOL improvements in cancer survivors (Arriba et al., 2010; Conn et al., 2006; Ferrer, Huedo-Medina, Johnson, Ryan, & Pescatello, 2011; Knobf et al., 2007; Knols et al, 2005; Mustian et al., 2009; Schmitz et al., 2010; Speck et al., 2010; Spence et al., 2010). Population level correlation studies have illustrated a positive association between PA and QOL, particularly in the physical and functional domains, for childhood (Keats et al., 2009), young adult (Belanger et al., 2011; Paxton, Jones, Rosoff, Bonner, Ater, & Demark-Wahnefried, 2010), and adult cancer survivors of mixed samples (Blanchard, Courneya, Stein, & American Cancer Society, 2008; Blanchard, Stein, & Courneya, 2010; Courneya, Keats, & Turner, 2000a; Paxton et al., 2010). Additional studies which have focused on individual cancer sites have also documented similar patterns in breast (Courneya & Friedenreich, 1998; Chen et al., 2009; Kendall et al., 2005; Mandelblatt et al., 2011; Milne et al., 2007; Valenti et al., 2008; Vallance et al., 2011), prostate (Keogh et al., 2010), bladder (Karvinen et al., 2007b), head and neck (Rogers et al., 2006), kidney (Trinh, Plotnikoff, Rhodes, North, & Courneya, 2011a),

lung (Coups et al., 2009), multiple myeloma (Jones et al., 2004), non-Hodgkin's lymphoma (Bellizzi et al., 2009; Vallance et al., 2005), colorectal (Courneya & Friedenreich, 1997b; Grimmett, Bridgewater, Steptoe, & Wardle, 2011; Lynch et al., 2007; Lynch, Cerin, Owen Hawkes, & Aitken, 2008; Peddle, Au, & Courneya, 2008; Pinto, Papandonatos, Goldstein, Marcus, & Farrell, 2013) and gynaecologic cancer survivors (Beesley et al., 2011; Beesley, Eakin, Janda, & Battistutta, 2008; Courneya et al., 2005a; Stevinson et al., 2007). Recent research has also demonstrated improved QOL for cancer patients receiving palliative care (Lowe, Watanabe, Baracos, & Courneya, 2009; Oeschsle et al., 2011). These findings have been supported by larger meta-analyses and systematic reviews (Conn et al., 2006; Mishra et al., 2012a, 2012b; Speck at al., 2010).

More recently Ferrer and colleagues (2011) reviewed 78 randomized controlled trials and studies with pre/post-test designs to determine the efficacy of interventions specifically in improving QOL. This analysis found exercise interventions to have a positive effect on QOL outcomes compared to control groups and baseline measures. Additionally, this analysis allowed for the comparison of the effect of various components of interventions on QOL. For instance, aerobic activity was found to be a significant predictor of QOL particularly for studies of longer duration (8+ weeks). More recent studies with gynaecologic cancer survivors which are not included in the meta-analyses also identified QOL improvements from involvement in lifestyle interventions which included PA (Donnelly et al., 2011; Newton et al., 2011; von Gruenigen et al., 2011a, 2011b).

While the Speck et al (2010) and Ferrer et al (2011) meta-analyses focused primarily on aerobic PA interventions, Cramp, James and Lambert (2010) focused their meta-analysis specifically on six randomized controlled trials to examine the efficacy of resistance training on QOL. They found resistance training to be statistically more effective than control conditions in increasing QOL.

With these positive implications, it is important to note that the safety of PA for cancer survivors both during and after treatment has been well documented (Pekmezi & Demark-Wahnefried, 2011; Schmitz et al., 2010), with no adverse effects reported as a result of PA during or after treatment (Speck et al., 2010). Additionally, PA has shown to

be feasible for cancer survivors (Quist et al., 2011), including gynaecologic cancer survivors (Donnelly et al., 2011; Newton et al., 2011). It has been speculated that this is likely a result of the enhanced ability of cancer survivors to engage in PA due to improvements in treatment modalities (Courneya, 2003; Courneya, 2009; Schmitz et al., 2005, 2010).

The positive implications on both the physical and functional domains of QOL are particularly noteworthy findings. While psychosocial interventions are available to cancer survivors and can contribute to improvements in QOL, they often offer limited effects on the physical and functional well-being of cancer survivors (Meyer & Mark, 1995), the two dimensions which have been identified to be important for QOL (Cella & Tulsky, 1990), particularly for cancer survivors (Courneya & Friedenreich, 1997b). The positive implications that PA can have on these two dimensions as well as the other domains of QOL, makes it an important intervention to explore.

2.4 Physical Activity Recommendations

The combination of the physical, psychological and overall QOL benefits of PA have led the American Cancer Society (ACS) and the American College of Sports Medicine (ACSM) to recommend that survivors perform at least 30 to 60 minutes of moderate-to-vigorous PA at least 5 days per week (Doyle et al., 2006; Haskell et al., 2007; Schmitz et al., 2010). Despite the creation of these guidelines, the number of cancer survivors meeting these recommendations remains relatively low across several cancer survivor groups (Blanchard et al., 2008; Hall et al., 2011; Kwon, Hou, & Wang, 2011): 35% breast (Vallance et al., 2011); 9% head and neck (Rogers et al., 2006); 25% colorectal cancer (Peddle et al., 2008); 30% endometrial (Courneya et al., 2005a); 24 % non-Hodgkin's lymphoma (Vallance et al., 2005); 20 % multiple myeloma (Jones et al., 2004); 31% ovarian (Stevinson et al., 2007); 30% kidney (Trinh et al., 2011a); and 22% bladder (Karvinen et al., 2007b).

As expected, studies have reported changes in PA levels across the cancer experience (Gjerset, Fossa, Courneya, Skovlund, & Thorsen, 2011b). Specifically, PA levels have been shown to decline during treatment and do not return to pre-diagnosis levels following the completion on treatment (Beesley et al., 2011; Lynch et al., 2007; Milne et al., 2007; Murnane et al., 2012; Peddle et al., 2008; Ryan, White, Roydhouse, &

Fethney, 2011; Trinh et al., 2011a; Valenti et al., 2008; Vallance et al., 2005, 2011). Of utmost importance and concern is that those individuals who are meeting the ACS/ACSM PA recommendations report higher QOL (Courneya et al., 2005a; Karvinen et al., 2007b; Lynch et al., 2007, 2008; Milne et al., 2007; Peddle et al., 2008; Stevinson et al., 2007; Trinh et al., 2011a; Vallance et al., 2005, 2011). As a result, there is a wealth of evidence to support the need to provide opportunities to cancer survivors to encourage their continued participation in PA.

2.5 Understanding and Increasing Physical Activity

2.5.1 The Role of Theoretical Frameworks.

In an effort to enhance PA participation it is first important to understand the underlying motivations for engaging in PA. Several correlates have been identified as potentially important constructs underlying PA in both healthy individuals and cancer survivors such as demographic (i.e., age, gender) and medical (i.e., co-morbid disease) factors, behavioural attributes (i.e., attitudes, motivation), and environmental characteristics (i.e., accessibility; Biddle & Fuchs, 2009; Gjerset et al., 2011b; Trost, Owen, Bauman, Sallis, & Brown, 2002).

Many theoretical frameworks have been employed to investigate and understand PA behaviours of cancer survivors and the correlates or constructs influencing behaviours. Theoretical frameworks are useful tools for understanding how these correlates may influence human behaviours such as PA. Specifically, theoretical frameworks aid in the identification of factors influencing behaviour and help to predict behavioural outcomes (Biddle & Fuchs, 2009; Dean, 1996; Goldman & Schmalz, 2001; Nigg, Allegrante, & Ory, 2002; Nutbeam & Harris, 2004; Pinto & Floyd, 2008; van Ryn & Heaney, 1992). Most importantly however, they illustrate possible relationships between behavioural determinants and the conditions and/or settings in which such relationships are present (Biddle & Fuchs, 2009; Conner & Norman, 2005; Dean, 1996; Goldman & Schmalz, 2001; Nigg et al., 2002; Nutbeam & Harris, 2004; Pinto & Floyd, 2008; van Ryn & Heaney, 1992).

Although researchers may be tempted to generalize the relationships between various correlates and behaviours (i.e., PA) from individual-level studies across populations, research evidence cautions at making such generalizations. In fact, a wealth

of evidence highlights the heterogeneity of populations, particularly between cancer survivor groups, supporting the need for studies of individual cancer site (Courneya, Blanchard, & Liang, 2001; Stevinson et al., 2009b; Karvinen et al., 2007a). For instance, disease and treatment-related factors have been shown to influence the ability and motivation for PA in cancer survivors (Gjerset et al., 2011b). However, as identified by Stevinson and colleagues (2009b), many of these factors differ between cancer groups. For instance, three subgroups of bladder cancer survivors were found to have significantly lower exercise participation rates: those who a) had received adjuvant therapy; b) had invasive disease; and c) were 64 years of age and over (Karvinen et al., 2009). Conversely, body mass, marital status, and income were found to be associated with exercise participation of endometrial cancer survivors in Karvinen and colleagues' (2007a) investigation. However, Jones and colleagues (2006a) found no significant influence of medical or demographic variables on the exercise behaviors of multiple myeloma cancer survivors. These findings provide support for Karvinen and colleagues (2007a) whom stated that "…different cancer survivor groups may present unique determinants of exercise, and generalizations among cancer survivor groups may not be warranted" (p. 2). As a result, identifying and understanding the determinants of behavior for individual populations is essential to the success of health promotion efforts.

2.5.2 Social Cognitive Theory.

Human behaviour, according to the social cognitive theory (SCT; Bandura, 1986), is explained in terms of a triadic interactional model. Within this model, personal factors (i.e., biological, cognitive, and affective events), environmental events, and behaviour interact and are determinants of one another (Bandura, 1986, 1997; Conner & Norman, 2005; Luszcynska & Schwarzer, 2005). Based on this theory, human beings are not just reactive beings; in fact, several attributes and capabilities of humans allow them to direct their own actions (i.e., outcome expectations, goals, sociocultural factors, behavioural capability, etc).

Many of these constructs have been studied in cancer survivors and have been found to influence their PA. For example, low perceptions of barriers such as time constraints (James et al., 2006), and the presence of role models (Rogers et al., 2005) have been found to be associated with increased PA levels in cancer survivors.

Self-efficacy sits at the heart of SCT, and is a commonly explored variable within the PA literature. Self-efficacy is conceptualized as "an individual's judgement about their capabilities to organize and execute courses of action required for attaining designated types of performances" (Bandura, 1986, p 391). In other words, it is an individual's judgement of one's confidence in their ability to successfully accomplish a specific task. A review of the correlates of PA (Trost et al., 2002) documented a consistent strong association between self-efficacy and PA in adults. Self-efficacy has been suggested to dictate action, effort, and persistence of behaviour change (Bandura 1986, 1997; Conner & Norman, 2005), and has also been found to be associated with initiation and maintenance of exercise behaviours (Keller, Fleury, Gregor-Holt, & Thompson, 1999). According to the SCT, self-efficacy is a requisite which makes behaviour change possible, as in the absence of a perception of ability individuals will be unlikely to attempt behaviours (Bandura, 2004). Comparatively, studies in cancer groups (i.e., breast, colon) have also documented the importance of self-efficacy. As expected, many studies have found self-efficacy to be associated with greater PA (James et al., 2006; Rogers et al., 2004, 2005; Taylor et al., 2006; Pinto et al., 2002). Bandura (1986) identified four specific sources of self-efficacy: performance attainment, vicarious experience, social/verbal persuasion, and physiological states. Performance attainment, also termed as mastery experience, recognizes that past experiences with behaviours both in terms of successes and failures influence our judgements about our capabilities. As the strongest source of self-efficacy, experience of success in the past will likely boost one's confidence in their abilities in contrast to failures which will hinder self-efficacy (Bandura, 1986). In the absence of past experience seeing others (who are similar to us) perform a task/behaviour (similar to the one we intend to perform), is also a significant source of self-efficacy. Verbal/social persuasion or feedback from significant/important others can also contribute to the development of self-efficacy. For example, encouraging feedback from a coach can boost self-efficacy (Bandura, 1986). However, the feedback must be realistic in the sense that it reflects an individual's actual capabilities or it can work to actually diminish self-efficacy (Bandura, 1986). Lastly, physiological states can also influence self-efficacy. For example, experiences of pain and fatigue can often be interpreted as vulnerability or inefficiency therefore hindering one's judgement of their

capabilities. Strategies enabling individuals to cope with such states may prevent these detrimental processes from happening.

In contrast to many theories which focus heavily on individual factors, SCT theory is often praised for its appreciation that human behaviour occurs within the social context and environment. However, this comprehensive model has a number of constructs making a complete application of the model quite difficult. In fact, it is evident within the literature that investigations rooted in SCT usually select specific constructs to observe and measure. Although research has suggested the use of comprehensive models, the use of SCT in its entirety seems challenging. Perhaps future studies, for both the general and cancer survivor population, can work to identify SCT constructs most influential for specific health behaviours.

2.5.3 Self-determination Theory.

The self-determination theory (SDT; Deci & Ryan, 1985, 2002) posits that humans have three basic psychological needs, competence (i.e., feeling effective), relatedness (i.e., a sense of belonging), and autonomy (i.e., a sense of control over behaviour). According to this theory human behaviour is a function of satisfying these three basic psychological needs (Biddle & Mutrie, 2008; Frederick-Recascino, 2002; Johnston, Breckon, & Hutchinson, 2002; Mack, Sabiston, McDonough, Wilson, & Paskevich, 2007; Ryan & Deci, 2000).

Within the SDT behavioural motivation lies on a continuum from highly autonomous motivation, with the location of behaviour initiation within oneself (i.e., intrinsic motivation) to highly controlled motivation in which location of behaviour initiation is external to one self (i.e., external motivation). Intrinsic motivation is motivation in the absence of external rewards; engaging in behaviour because of its inherent satisfaction (i.e., enjoyment, interest). On the other end of the continuum lies extrinsic motivation, behaviour directed by rewards, money, and pressures (i.e., external contingency; Biddle & Mutrie, 2008; Deci & Ryan, 1985, 2002; Ryan & Deci, 2000, 2007). Also along this continuum are three types of extrinsic motivation increasing in their 'autonomous' nature: introjected, identified, and integrated motivation (Deci & Ryan, 2002; Ryan & Deci, 2007). Introjected motivation occurs when behaviour is performed to avoid guilt/shame or out of fear of punishment, identified motivation occurs

when behaviour is linked to personally valued goals/outcomes (i.e., behaviour is valued but not necessarily enjoyed), and integrated motivation occurs when behaviour is symbolic of a person's identity. Additionally, there is complete lack of motivation known as amotivation. SDT also posits that individual motivation can move along this continuum. In particular, this theory proposes that extrinsically motivated behaviour can become internalized allowing for motivation of a more autonomous nature. However, environments must provide a sense of competence, autonomy, and to a lesser extent a sense of relatedness to facilitate this internalization process (Biddle & Mutrie, 2008; Deci & Ryan, 2002; Ryan & Deci, 2007). Interestingly, environments can also impede this internalization process. For example, research has shown that providing a reward to an intrinsically motivated behaviour undermines the sense of autonomy and can shift the behaviour to be more externally regulated (Deci & Ryan, 2002; Mack et al., 2007). In contrast, providing feedback which increases an individual's sense of competence can facilitate the internalization of motivation allowing for progression up the motivation continuum. Thus environments fostering choice, support, feedback, and less pressure can foster intrinsic motivation (Mack et al, 2007; Ryan & Deci, 2007).The importance of intrinsic motivation is seen in its' relationship to behaviour modification. For example, within the general population self-determined or intrinsic/autonomous motivation has been found to be associated with more frequent exercise behaviours and increased adherence (Markland & Ingledew, 2007; Ryan & Deci, 2007). Similar findings have also been documented in cancer survivors. For example, more minutes dedicated to moderate to vigorous PA in cancer survivors has been associated with autonomous motives, as have physical fitness and more positive attitudes towards exercise behaviour (Wilson, Blanchard, Nehl, & Baxter, 2006). Additionally, breast cancer survivors who meet PA recommendations have also been found to report more autonomous motivation (Milne, Wallman, Guilfoyle, Gordon, & Courneya, 2008). Likewise, self-determined forms of motivation were found to have the largest positive associations with exercise behaviour in colorectal cancer survivors (Peddle et al., 2008).

As discussed within the SDT, contextual factors have an influence on motivational orientations, fostering or hindering the development of autonomous motivation (Chatzisarantis & Hagger, 2009; Deci, Eghrari, Patrick, & Leone, 1994: Deci

& Ryan, 1985). Environments which support the satisfaction of the three psychological needs are considered 'autonomy supportive'. The importance of an 'autonomy supportive' environment has been found within the context of exercise for both the general population (Chatzisarantis & Hagger, 2009; Vansteenkiste, Simons, Soenens, & Lens, 2004; Wilson, Rodgers, Blanchard, & Gessell, 2003) and cancer survivors. Specifically, environments perceived to support psychological needs have been positively associated with more autonomous regulations and negatively associated with controlled motivation for exercise behaviour in cancer survivors (Milne et al., 2008).

2.5.4 Transtheoretical Model.

The transtheoretical model (TTM; Prochaska & DiClemente, 1983; Prochaska, DiClimente, & Narcoss, 1992) is a multi-component theory of behaviour change which suggests behaviour change occurs through the progression of a series of five stages: pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska & DiClemente, 1983; Prochaska et al., 1992). Despite a logical progression of stages, this theory acknowledges that behaviour change is a dynamic process, which may not occur in a linear fashion, but rather a cyclical one (Prochaska et al., 1992). As such, individuals can enter at any stage of change and can progress or regress through the stages.

According to this theory, three components have been proposed to mediate the behaviour change process: processes of change, decisional balance, and self-efficacy. The 'processes of change' are strategies that can be employed by individuals to help them progress through the stages of change (Biddle & Mutrie, 2008; Marcus & Simkin, 1994; Prochaska & DiClemente, 1983). These strategies can be cognitive (i.e., consciousness-raising, dramatic relief, self-re-evaluation, environmental re-evaluation, social liberation) and/or behavioural (i.e., self-liberation, helping relationships, counter conditioning, contingency management, stimulus control; Marshall & Biddle, 2001; Prochaska & DiClemente, 1983). For example, consciousness raising or information seeking is a process of increasing information about the activity at hand. Behavioural cues, or creating reminders and prompts (i.e., a pair of sneakers by the front door) is a behavioural strategy that may be used. Decisional balance, another strategy used to make behaviour change, is the evaluation of the pros and cons (i.e., benefits/costs) of the behaviour change (Biddle & Mutrie, 2008). In the earlier stages of change the cons outweigh the pros, in contrast to

the later stages were decisional balance shifts and the pros outweigh the cons. The last component of the theory, rarely acknowledged in the PA literature as a component of TTM, is self-efficacy and temptation. In the early stages of change, temptation is high, and self-efficacy is low. In contrast, as individuals progress self-efficacy increases and temptation decreases (Marcus & Simkin, 1994). Taken together, working to ensure individuals perceive the pros of behaviour change to outweigh cons, and ensuring a sense of self-efficacy can assist with progression through the stages (Biddle & Mutrie, 2008; Marcus & Simkin, 1994).

Findings on the efficacy of TTM for PA appear to be mixed. While Biddle and colleagues (2005) caution on the effectiveness of TTM interventions for a range of health behaviours, an earlier review by Marcus and Simkin (1994) find the TTM to be a useful theoretical framework particularly when exploring exercise behaviours. A critical review of 16 activity promotion interventions (Adams & White, 2003) found interventions grounded in the TTM to be more effective that non-staged interventions in short-term activity adoption.

Although fewer in number, interventions for cancer populations have also utilized the TTM and they have been found to be effective in increasing PA. One study found that breast cancer patients who received PA counselling tailored to their stage of change, compared to a control group, resulted in increased PA and an increase in their readiness to change. Most importantly, these increases in PA were associated with positive outcomes (i.e., increased vigor; Pinto, Frierson, Rabin, Trunzo, & Marcus, 2005).

Interestingly, grand claims of the effectiveness of these interventions are cautioned by Adams and White (2003). They suggest there is a need for studies to test stage-tailored interventions on people within all stages, as opposed to starting with sedentary individuals in the early stages of change. The success of such studies will depend on an accurate determination of stages of change, which many studies have lacked (Bridle et al., 2005; Bunton, Baldwin, Flynn, & Whitelaw, 2000; Spencer et al., 2006). In fact, the arbitrary boundaries between the stages of change have been identified as a limitation of this theory (Nutbeam & Harris, 2004). The development of a universal measure to accurately assess stage of change is suggested by Marhsall and Biddle (2003) and will likely strengthen future studies. Despite TTM's utility in understanding and

describing behavioural readiness, it is limited in its predictive utility thus practically flawed.

2.5.5 Theory of Planned Behaviour.

The theory of planned behaviour on the other hand (TPB; Ajzen, 1985) is a popular theoretical framework that has been useful in explaining a moderate amount of the variance of PA in both healthy (Armitage & Conner, 2001; Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron, & Mack, 1997) and cancer survivor populations (Andrykowski, Beacham, Schmidt, & Harper, 2006; Courneya, Friedenreich, Arthur, & Bobick, 1999; Courneya, Vallance, Jones, & Reiman, 2005b; Karvinen et al., 2007a, 2009; Stevinson et al., 2009b).

The TPB posits that the most proximal determinant of behaviour captures an individual's motivation for, and effort they are willing to exert to perform a behaviour, termed as intentions (Ajzen, 1985, 1991). This conceptualization suggests that the stronger an intention towards a behaviour, the more likely performance of the behaviour will occur. Within the TPB, intentions are formed based on three components: an individual's attitude (the degree of unfavourable/favourable evaluations of engaging in an intended behaviour), subjective norms (perceived social pressure to perform/not perform a behaviour) and perceptions of behavioural control (perception of the ease or difficulty of performing the behaviour; Ajzen 1985, 1991).

Research focusing on PA and exercise, has supported the utility of the TPB in understanding these behaviours across a variety of population demographics (Hagger et. al., 2002) including some cancer survivor groups. Specifically, consistent with the tenants of the TPB, intentions have been found to be correlated with PA behaviour in cancer survivors (Courneya et al., 1999; Karvinen et al., 2007a, 2009). In fact, intentions were found to be the sole independent correlate of PA in ovarian cancer survivors (Stevinson et al. 2009b). Also consistent with the tenants of the TPB, attitudes have consistently been found to have the strongest association with intentions (Andrykowski et al., 2006; Courneya et al., 1999). Perceived behavioural control has also been found to be associated with PA intentions (Andrykowski et al., 2006; Courneya et al., 2005b; Jones et al., 2006a; Stevinson et al., 2009b). Mixed findings however have been documented for

the influence of subjective norms, often finding weak associations with intentions (Andrykowski et al., 2006).

To date, the bulk of research has examined attitudes, subjective norms, and perceived behavioural control have been assessed as individual components, making the TPB a relatively simplistic model for predicting behaviour (Armitage & Conner, 1991). While this simple model may be optimal for explaining and predicting some behaviours, an expanded model which incorporates two components of attitudes, subjective norms, and perceived behavioural control may serve to explain and predict other behaviours (Rhodes & Courneya, 2003). Specifically, Ajzen (1991) suggests a difference between 'hot' and 'cold', or affective and instrumental components of attitudes. The affective component comprises an individual's emotional reactions or feeling derived from a behaviour (i.e., pleasant-unpleasant) whereas the instrumental components comprise evaluative judgements of the perceived costs/benefits of performing a behaviour (i.e., harmful-helpful). The discriminate validity of these components is supported within the literature (Ajzen, 1991; Ajzen & Driver, 1991; Conner & Armitage, 1998; Hagger & Chatzisarantis, 2005; Rhodes & Courneya, 2003; Rhodes, Courneya, & Metheson, 2006).

Likewise, subjective norms are suggested to be comprised of injunctive (i.e., perceptions of others' approval of PA) and descriptive components (i.e., perceptions that important others engage in PA). Reno, Cialdini and Kallgren (1993) suggest that the influence of the particular components may have more power in explaining some behaviour than others. In fact, studies within the exercise domain have tended to focus soley on the influence on injunctive norms (Ajzen & Driver, 1991; Chatzisarantis & Biddle, 1998), despite descriptive norms having been shown to provide some predictive influence on behavioural intentions (Conner & Sparks, 2005), particularly exercise intention and behaviour (Okun, Karoly, & Lutz, 2002).

Lastly, perceived behavioural control is comprised of a self-efficacy component (i.e., confidence in ability to engage in PA) and a perceived control component (i.e., perceived control over PA; Conner & Sparks, 2005). The self-efficacy component is suggested to capture the ease/difficulty of performing a behaviour, and the controllability component is suggested to capture the actor's control over the behaviour. Research provides evidence for the distinction between these two components across a variety of

behaviours (Armitage & Conner, 1999; Conner & Armitage, 1998; Manstead & van Eekelen, 1998; Trafimow, Sheeran, Conner, & Finlay, 2002) including exercise (Rhodes & Courneya, 2003; Rhodes et al., 2006; Terry & O'Leary, 1995).

Interestingly, the predictive strength of these components has been shown to vary between cancer survivor populations (Blanchard, Courneya, Rodgers, & Murnaghan, 2002; Courneya & Friedenreich, 1997b; Courneya et al., 1999, 2001; 2005b; Courneya, Keats, & Turner, 2000a; Jones et al., 2006a; Karvinen et al., 2007a, 2009; Keats, Culos-Reed, Courneya, & McBride, 2007; Rhodes & Courneya, 2003) and even within cancer sites (Karvinen et al., 2009). As discussed by Hagger and Chatzisarantis (2005), discriminate validity provides support for the two component model, however the high degree of commonality between the components can also allow for the individual components to be summed into a more global construct (i.e., attitudes, subjective norms, perceived behavioural control). It appears that the question or issue under investigation will determine whether the two-components will be individually measured or not (Hagger & Chatzisarantis, 2005; Trafimow et al., 2002).

However, a thorough examination of research between cancer groups highlights inconsistencies in the influence of the global constructs, attitudes, subjective norms, and perceived behavioural control on intentions. For example, Jones et al. (2006a) found instrumental attitudes to be important in influencing intentions in the studied group of multiple myeloma cancer survivors, whereas Courneya et al. (2005) found affective attitudes to be the strongest correlate with intentions for the studied non-Hodgkin's lymphoma population. In fact, instrumental attitudes were not found to be a significant correlate of intention for this non-Hodgkin's lymphoma group. Moreover, Blanchard and colleagues (2002) found all three tenants to be associated with intentions for PA in breast cancer patients after treatment, in contrast to PBC as an independent correlate of intentions in prostate patients after treatment. Equally important, is that differences within cancer site groups have also been found. For example, Karvinen et al. (2009) found affective attitudes to be an independent correlate for younger (<65 years) bladder cancer survivors, but not for older survivors (+65 years).

On the surface, the inconsistencies in the relationships between various correlates and behaviour could be attributed to the ineffectiveness and inconsistency in the use of

the two component model, definitions, and measurements within TPB. However as suggested by Jones et al. (2006a), these inconsistencies may instead be attributed to the differences between cancer site populations in terms of demographics, treatments, and symptoms/side effects, thus having an influence on individuals' beliefs about exercise. This finding is consistent with the TPB, as Ajzen (1991, p.191) emphasized that the influence of attitudes, subjective norms, and perceived behavioural control on behavioural intentions will vary across situations (i.e., behaviour adoption, adherence, and maintenance) and populations.

2.6 Understanding the Needs & Wants: Physical Activity Preferences

A key component to the success of the TPB in predicting behaviour, particularly when evidence illustrates correlates of behaviour to differ between groups, is the elicitation of salient beliefs. According to the TPB, attitudes, subjective norms, and perceived behavioural control are a function of underlying belief systems: behavioural, normative, and control beliefs (Ajzen, 1985; 1991). Specifically, attitudes are formed based on behavioural beliefs, which are beliefs that behaviours are associated with particular consequences or outcomes and an individual's subjective evaluation or appraisal of those outcomes. The subjective value of consequences and the likelihood of a behaviour producing the outcome form our attitudes; favourable attitudes are formed towards behaviours we associate with favourable consequences, and unfavourable attitudes are formed towards behaviours associated with unfavourable consequences. Subjective norms are formed based on normative beliefs, which are beliefs important referent groups hold towards performance of behaviour. The strength of this belief is a function of the individual's willingness to comply with these individuals. Control beliefs, the perceptions of the presence or absence of resources required to perform the behaviour in question influence perceived behavioural control (Ajzen, 1991). The perceptions of the required resources and the perception of power the factor has on facilitating or impeding behaviour determine perceptions of behavioural control. According to this theory, more favourable attitudes, subjective norms and perceptions of behavioural control influence the formation of an intention to perform a behaviour. It is the elicitation and understanding of the 'salient' beliefs of distinct groups that enable the TPB to enhance its predictive utility.

Just as health promotion efforts can be enhanced by targeting basic salient beliefs, promotion efforts may be further enhanced by targeting the specific needs, interest and preferences of cancer survivor groups (Trinh et al., 2011b). Information about individuals' preferences and interest in a specific behaviour, is some of the most basic motivations of human behaviour, thus are some of the most basic fundamentals required to ensure the success of PA interventions for these populations. In fact, these have been shown to have an important effect on both initial motivation and adherence to exercise programs (Courneya, Friedenreich, Sela, Quinney, & Rhodes, 2002).

Studies which have collected data on this topic have asked questions about interest in PA counselling, preferred timings of such counselling, and PA programs/activities, location and timing of such programs (Belanger et al., 2011; Blaney, Lowe-Hrong, Rankin-Watts, Campbell, & Gracey, 2013; Demark-Wahnefried et al., 2000; Gjerset et al., 2011a; Jones & Courneya, 2002; Jones et al., 2007; Karvinen et al., 2006, 2007c; McGowan et al., 2013; Murnane et al., 2012; Rogers et al., 2009b, 2009c; Stevinson et al., 2009a; Trinh et al., 2011b; Vallance et al., 2006). Interestingly, despite PA levels of cancer survivors being documented to be low, survivor groups do report an interest in PA programs (Demark-Wahnefried et al., 2000; McGowan et al., 2013; Oechsle et al., 2011), with most, including gynaecological cancer survivors, showing a preference for post-treatment walking programs (Gjerset et al., 2011a; Jones & Courneya, 2002; Jones et al., 2007; Karvinen et al., 2006; Karvinen et al., 2007c; Murnane et al., 2012; Rogers et al., 2009b; Stevinson et al., 2009a; Trinh et al., 2011b; Vallance et al., 2006). These findings may suggest that the low PA levels of cancer survivors may not be due to a lack of motivation, rather a lack of opportunities which meet survivors' PA needs, preferences and/or interests. In fact, a recent qualitative study with service care providers acknowledged "…a need for more physical activity resources and programmes for cancer survivors" (Robertson, Richards, Egan, & Szymlek-Gay, 2012). Gynaecologic cancer survivors for example have demonstrated knowledge around the benefits of PA (Lukowski, Gil, & Jenison, 2011) and an interest in PA programs (Karvinen et al., 2007c; Stevinson et al., 2009a) however their PA levels remain low (Stevinson et al., 2009a). Of note, within the same qualitative study, gynaecologic cancer survivors were identified as one group with unmet needs regarding PA (Roberston et al., 2012).

A greater depth and breadth of understanding survivor motivation is clearly needed. One way to achieve this is to gather information about cancer survivors PA program preferences. While PA preferences have been assessed across a variety of cancer sites (Belanger et al., 2011; Gjerset et al., 2011a; Jones & Courneya, 2002; Jones et al., 2007; Karvinen et al., 2006 2007c; McGowan et al., 2013; Murnane et al., 2012; Oechsle et al., 2011; Pinto & Ciccolo, 2011; Rogers et al., 2009c; Stevinson et al., 2009a; Trinh et al., 2011b;Vallance et al., 2006), these studies have been limited to asking closed-ended questions to gather their information. While a useful starting point, such techniques are limited in their ability to get a full and more complete understandings of the issues or concerns; in short, what do survivors really want/need from a PA program? In contrast, during discussions such as those in interviews "…researchers [can] explore in detail the experiences, motives and opinions of others" (p. 3, Rubin & Rubin, 2012). As a result, opportunities for cancer survivors to expand on their PA preferences and reasons why they are so by way of open-ended, semi-structured interviews may provide important information and may be an essential component to understanding and increasing PA levels, and ultimately QOL within these individuals.

2.7 Quality Physical Activity Monitoring in Cancer Research

2.7.1 Moving Away from Self-Report.

PA has an important place within the lives of individuals diagnosed with cancer and at multiple points along the cancer trajectory, particularly due to the QOL benefits physically active survivors can experience. While this relationship is promising, and has facilitated the development of a variety of PA interventions for cancer survivors, a major limitation of the research conducted to date is that it has relied heavily on subjective or self-report measures of PA.

PA surveys are available for the collection of data for a variety of age groups, physical activities, and even time periods. This versatility, as well as their relatively low cost and ease of administration, provides logical rationale for their extensive use within the literature. The low cost and effort associated with self-report measures available makes them particularly attractive for use in large-scale studies and have been the measure of choice for large cross-sectional studies for cancer survivors. Pre-post test studies and randomized controlled trials with cancer survivors have also relied on self-

report measures to collect their PA data (Courneya, et al., 2003; Culos-Reed et al., 2010; Ferrer et al., 2011; Hawkes, Gollschewski, Lynch, & Chambers, 2009; Morey et al., 2009).

The downside of these instruments is their reliance on subjective interpretations of PA, memory recall, and issues of bias which may affect the reliability, validity, and accuracy of the data collected (Yang & Hsu, 2010; Dishman et al., 2001; Durante & Ainsworth, 1996; Eslinger & Trembaly, 2007; Freedson, Melanson, & Sirard, 1998; Jacobs et al., 1993; Janz, 2006; Prince et al., 2008; Sallis & Saelens, 2000; Shephard, 2003; Ward, Evenson, Vaughn, Rodgers, & Troiano, 2005). For example, an individual's ability to accurately recall the details of a past activity, also termed recall bias, has been shown to have a negative influence on the accuracy of information. Memory recall is a very complex cognitive task, with many places for error in retrieving information (Dishman et al., 2001). While age and gender have been shown to have a role in memory recall (Mustian et al., 2009), other factors can also influence our ability to remember our PA. For example, Sallis and colleagues (1985) have documented more accurate recall of higher intensity activities compared to activities of lower intensities, a finding also supported by more recent work (Salis and Saelens, 2000; Shephard, 2003 Slattery & Jacobs, 1995). The length of the recall period that participants are required to remember (i.e., over the past year vs. over the past week) also have implications on the accuracy of recall with longer recall likely associated with greater inaccuracies/errors (Dishman et al., 2001; Shephard, 2003).

Social desirability, or the tendency for individuals to respond consistent with cultural norms, has also been found to be associated with an overestimation of self-reported PA (Dishman et al., 2001; Eslinger & Tremblay, 2007; Shephard, 2003). Such over-estimation can lead to inaccurate reporting of PA reporting and patterns or relationships between PA and various health outcomes. While various techniques and restructuring of survey questions have been suggested to reduce the chance of errors (Durante & Ainsworth, 1996) more recent research is suggesting and supporting the use of more objective measures of PA.

2.7.2 Objective Monitoring.

Recent evidence within the Canadian population has stimulated a shift in methodology for measuring PA toward the use of objective measures of PA. Canadian evidence illustrated increases in the proportion of the population who reported being active, with 52% reporting to be moderately active during leisure time (Statistics Canada, 2010) while evidence continued to document the rates of obesity to be on the rise, and a decline in fitness (Colley et al., 2011; Sheilds et al., 2010). These contradictory findings (Katzmarzyk & Tremblay, 2007) led to the use of objective measures of PA in place of self-report methodology, particularly within the most-recent version of the Canadian Health Measures Survey (CHMS; 2007-2009). Consistent with the documented decreases in fitness and increases in obesity, 68% of men and 69% of women were found to spend the majority of their waking hours in sedentary activity. In fact, according to CHMS only 5% of adults were found to 'actually' be meeting the PA guidelines on a regular basis (Canadian Fitness & Lifestyle Research Institute, 2009). In addition to these findings, other evidence supports the use of objective measures when possible. Objective measures of PA can overcome many of the limitations of self-report measures (i.e., recall, social desirability bias) thus increasing the accuracy of measures of PA (Prince et al., 2008). In addition, it is suggested that objective measures may be more likely to detect significant associations between PA and important health outcomes (Janz, 2006; Prince et al., 2008).

Despite their superiority, the use of objective measures to investigate associations between PA and QOL in cancer survivors is scarce. As a result, there is limited evidence suggesting improvements in QOL are linked with increases in 'actual' PA within cancer survivors. Direct observation has been the most common form of objective PA measurement that has been used within cancer survivors to explore its effects on QOL (41 studies out of 78 reviewed by Ferrer et al., 2010). Attendance to structured and/or supervised PA programs is often used to differentiate between exercise and control groups, or to signify involvement in a pre and post-test design. The presence and monitoring of a trained supervisor eliminates the need of self-report PA tools. However, while the validity of the measured PA is increased, these methods require time, money, and trained personnel to see the projects through, significantly affecting their feasibility, particularly for large-scale studies (Esligner & Tremblay, 2007). More importantly, these

community-based supervised programs do not meet the needs or preference for home-based PA programs which have been identified by the majority of cancer survivors. Some studies have utilized home-based interventions (12 of 78 studies reviewed by Ferrer et al., 2010) in which cancer survivors were counselled or given exercise prescriptions to follow, differentiating between control or pre-test conditions. Unfortunately, in the absence of direct observation, the researchers most often relied on self-report measures or activity logs to measure PA levels.

Objective activity monitors, such as pedometers and accelerometers are becoming more popular within the PA literature (Loprinzi, Lee & Cardinal, 2013, Lynch et al., 2010, 2011). These tools provide a balance between feasibility and validity. Pedometers, also known as step counters, provide a measure of the number of steps taken by an individual by detecting the impact produced during locomotion. Pedometers may be the simplest wearable sensors according to Yang and Hsu (2010). While pedometers are often easier to use, less expensive and provide real-time accessible feedback, accelerometers have been accepted as useful devices for measuring PA (Eslinger & Tremblay, 2007: Janz, 2006).

Accelerometers date back to the 1950s, however with recent technological improvements they have made their way into PA research (Eslinger & Tremblay, 2007; Godfrey, Conway, Meagher, & OLaighan, 2008). In fact, accelerometers have now made their way into national PA assessments in both the USA (National Health and Nutritional Examination Survey [NHANES]; Troiano et al., 2005) and Canada (CHMS, Tremblay et al., 2007). Accelerometers provide measures of the acceleration of the body in different directions (i.e., horizontal, vertical, sagittal). The direct relationship between acceleration and the external force required to generate acceleration permits PA intensity information to be gathered (Dishman et al., 2001; Yang & Hsu, 2010). Additionally, accelerometers can provide information on sedentary time, an outcome variable that has been receiving increased attention within the PA literature (Eslinger & Tremblay, 2007; Lynch et al., 2010, 2011; Rogers, 2010). While measurement techniques such as doubly labelled water or calorimetry are the most valid to determine energy expenditure, their high cost and requirement for skilled personnel make them unsuitable for large-scale studies (Eslinger & Tremblay, 2007; Godfrey et al., 2008; Prince et al., 2008). Accelerometers on the

other hand offer a convenient alternative, providing an improvement in validity from self-report measures while maintaining reasonable feasibility.

Despite these findings which support objective measures to be superior than the commonly used self-report measures, only 10 randomized controlled trials involving cancer survivors have been found to utilize objective PA monitoring, specifically a pedometer or an accelerometer (Rogers, 2010). The primary purpose of most of these studies was to explore the effect of a particular PA intervention on PA levels (Rogers, 2010). For example, Irwin and colleages (2008) and Mustian and colleagues (2009) used pedometers to monitor participant PA adherence compared to a usual-care group, Mustian et al (2009), for example, compared 'daily steps walked' of an intervention and control group at baseline and after a 4 week intervention. Mustian and colleagues (2009) found a significant increase in the 'daily steps walked' for the intervention group compared to the control group.

Accelerometers have also been used within randomized controlled trials to monitor PA adherence (Rogers et al., 2009; Demark-Wahnefried et al., 2008). Pinto and colleagues (2005, 2013) and Matthews et al., (2007) utilized both pedometers and accelerometers in their investigations. Pinto et al (2005) utilized pedometers to serve as motivation and to monitor PA levels, and accelerometers to assess caloric expenditure at baseline and study completion. Similarly, Matthews et al (2007) utilized pedometers for motivation, and accelerometers to assess adherence through steps and activity counts. Subsamples of the US NHANES studies have allowed researchers to start examining PA levels in larger samples of cancer survivors using accelerometers (Loprinzi et al., 2013; Lynch et al., 2010, 2011).

The agreement between self-reported PA and objectively measured PA within cancer populations are inconsistent. While some studies have found a consistent relationship between self-reported and objectively measured PA (i.e., increases in self-reported PA are corroborated with increased in objectively measured PA; Matthews et al., 2007; Sloan, Snyder, Demark-Wahnefried, Lobach, & Kraus, 2009), this is not always the case. Similar to the pattern found in the general Canadian population, significant improvements in self-report PA without a significant improvement in objectively measured PA has been found (Pinto et al., 2005; Rogers et al., 2009a; Vallance et al.,

2007). Pinto and colleagues (2005), for instance, found significant differences in PA levels in favour of their intervention group for self-report and pedometer data (average steps) data, but this was not supported by the accelerometer data. Similarly, the Activity Promotion Trial by Vallance and colleagues (2007) documented significant improvements in favour of their 3 intervention groups on self-reported PA compared to the standard care group. However, no difference in PA measured by a pedometer between the intervention and control groups was found. The inability of pedometers to differentiate between PA of different intensities may explain this null effect. Vallance et al (2007) suggest that cancer survivors may have replaced their 'light' steps with 'moderate-to-vigorous' steps. However reporting errors associated with subjective PA assessment could be at play. These discrepancies provide significant rationale for the use of objective measures to explore the relationship between PA and various health outcomes such as QOL. Troiano and colleagues (2008) suggest studies exploring such relationships with use of objective measures may produce different relationships. For instance, lower levels of objectively measured PA may correspond with positive health outcomes, as lower levels of objectively measured PA have been shown to correspond with higher levels of self-reported PA.

Despite the large body of evidence illustrating the positive relationship between PA and QOL, a limited number of studies have utilized objective PA monitors to further understand the relationship. Rogers (2010) identifies that no study to date has been found which utilizes objective measures to explore the relationship between specific characteristics of PA (i.e., type, frequency, duration) and specific health outcomes, and is a much needed direction of future studies. In fact, one of the two studies which explored the relationship between PA and QOL, stated only that the exercise group showed significantly higher QOL than the control group both at post-intervention and at 3-month follow-up (Mustian et al., 2009). Unfortunately, no discussion into the specific thresholds for QOL improvements or the characteristics of PA that was associated with the improvements in QOL are explored or discussed. Demark-Wahnefried and colleagues (2008) also explored QOL changes, but again simply explored the difference in mean scores between individuals in the 3 intervention groups. A review of registered clinical trials reporting the use of accelerometers/pedometers, found only 26 registered studies

(Rogers 2010). While the majority of this work is being conducted on the breast cancer population, prostate, lung, head and neck cancer survivors are also being studied. Additionally, two studies will be extending investigations into gynaecologic cancers specifically endometrial and cervical cancer populations. Details into the methodology of these studies are limited, however, the objective tools were identified as being used for motivation or adherence purposes (Rogers, 2010).

2.8 Rationale & Significance

Due to the methodological limitations within the PA literature pertaining to associations of 'actual' PA with QOL in cancer survivors this study will explore both subjective and objective measures of PA and their relationship with QOL in gynaecologic cancer survivors in a new geographic region, Nova Scotia. This study will also provide an opportunity for cancer survivors to expand on their interests and preferences for PA, by combining closed-ended items with an opportunity for short, semi-structured interviews with the primary investigator.

2.9 Research Objectives & Hypotheses

Objective I.

To explore the current levels of PA in gynaecologic cancer survivors based on both self-reported and objective PA measures

Hypothesis I.

It is hypothesized, that the number of gynaecologic cancer survivors in Nova Scotia meeting public guidelines will be low (approximately 20 to 30 %)

Objective II.

To explore the relationship between both self-reported and objectively measured PA and QOL in gynaecologic cancer survivors in Nova Scotia

Hypothesis II.

It is hypothesized that gynaecologic cancer survivors in Nova Scotia who engage in higher levels of PA, as measured by self-report and/or objective measures, will report higher QOL

Objective III.

To explore the relationship between objectively measured PA and self-reported PA

Hypothesis III.

It is anticipated that cancer survivors self-reported PA will be lower than objectively measured PA levels

Objective IV.

To explore the PA interests and preferences of gynaecologic cancer survivors in Nova Scotia

Chapter 3: Methodology

3.1 Design

This study was carried out in two phases. Phase I of the study utilized the data from the Nova Scotia Cancer Registry (NSCR) operated by Cancer Care Nova Scotia (CCNS). The NSCR is a component of the disease surveillance information system within CCNS and contains a standard set of data on all newly diagnosed cases of cancer in Nova Scotia. A key principle of the Registry is confidentiality which is maintained throughout the Registry's data collection and reporting activities and while researchers may use the Registry's information for their investigations, their access to the information is limited. For studies involving patient contact, researchers are required to provide CCNS with all of the required study materials, and the Registry will identify, mail out or distribute the materials accordingly, thus maintaining the confidentiality of the Registry participants. As such, researchers do not have access to the names or contact information of Registry participants unless patients consent to this taking place.

Prior to initiating the study, approval of the proposed project and its methodology was obtained from CCNS on August 24, 2011. Upon receipt of CCNS approval, ethical review and approval was sought and received from the Capital Regional Health Authority on October 20, 2011. Lastly, approval from the Department of Health and Wellness was received on December 21, 2011. This approval was required for the release of and access to the personal information required for CCNS activities.

Upon receipt of these approvals Phase I of the study commenced with the identification of eligible survivors through the NSCR. Phase I consisted of a postal survey administered to gynaecologic cancer survivors residing in Nova Scotia. A sample of eligible and consenting gynaecologic cancer survivors residing within the HRM from Phase I participated in Phase II of the study. Phase II asked participants to wear an accelerometer for a 9-day period and complete an additional package of self-report PA and QOL questionnaires as well participate in a short, semi-structured interview about their PA preferences.

3.2 Participants

3.2.1 Phase I.

The study sample for Phase I was obtained from the NSCR. Participants were eligible if they met the following criteria: 1) between 18 and 69 years of age at time of diagnosis; and had a 2) diagnosis of histologically confirmed invasive gynaecologic cancer after January 1, 2001. In order to focus on individual cancer diagnoses, women with more than one diagnosis of gynaecologic cancer were excluded from the study.

3.2.2. Phase II.

Participants who completed the postal survey were asked if they were interested in participating in Phase II of the study. Participants were eligible if they met the following criteria: 1) Resident of the HRM; and were 2) between 18-65 years of age.

3.3 Procedures

3.3.1 Phase I

Eligible participants were mailed a study pack containing: an introductory cover letter, a letter of information (from both the NSCR and the Principal Investigator), consent form, questionnaire booklet, instructions on the process of returning the survey, and a stamped, self-addressed return envelope (see Appendix C, D, and E). The cover letter and consent form provided information about: a) how the participants were identified; b) the rationale for the study; c) what participating in the study entailed; d) potential risks/harms; e) privacy and confidentiality; f) the choice to volunteer to participate; and g) the freedom to choose not respond to any questions and/or withdraw from the study at any time (the contact information of the research coordinator was provided within the cover letter). Individuals who chose to participate in the study were asked to return the completed study pack to CCNS in the postage-paid, addressed envelope. In the event that participants elected not to participate in the study, they were asked to complete and return an 'opt-out form' (see Appendix F) so no further correspondence would be made.

In an effort to maximize response rate, quality features (i.e., personalized letters, postage paid envelope) were incorporated into the study design (Dillman, 2007; Laws, 2001). A postcard reminder was sent to all non-respondents after approximately two

weeks and a second study pack after five weeks (see Appendix G)**.** Participants who did not respond after the second study pack were considered non-responders. Medical and demographic information (i.e., age, cancer type/sub-type, months since diagnosis, and disease stage) of non-responders was obtained from the Registry and was used to compare non-responders to responders to determine the representativeness of the sample.

3.3.2 Phase II.

Within the cover letter and letter of information participants were provided details and eligibility criteria for Phase II. If interested, participants were asked to provide contact information (phone or email contact) and consent to being contacted by the Principal Investigator. Interested participants were contacted to discuss Phase II of the study. During these discussions the Principal Investigator confirmed that each participant met the eligibility criteria. Verbal consent was obtained from participants and a face-to-face meeting was arranged with the Principal Investigator. At this meeting, the Phase II study and consent form was reviewed and written informed consent was obtained (see Appendix H). Participants were outfitted with an accelerometer which they were instructed was to be worn on their hip, and provided detailed instructions about the device. They were asked to wear the device continuously (i.e., from the time they woke up in the morning to the time they went to bed) for nine consecutive days. At this time participants were provided with a second study pack which was to be completed at the end of the 9-day cycle (see Appendix I). A second face-to-face meeting was also arranged with participants for the return of the equipment and questionnaire package. At this time, participants had the option of participating in a short (15 to 20 minutes) semi-structured interview that asked about their preferences and interest in PA programs (see Appendix J).

3.4 Measures

3.4.1 Phase I.

Medical and Demographic Variables.

Medical and demographic variables were collected via self-report. The demographic variables collected included: age, ethnicity, education level, marital status, annual income, and employment status. Medical variables included: disease type, disease stage, date of diagnosis, types of treatment(s) and current disease status.

Physical Activity.

Two questionnaires were administered to collect PA information. Firstly, PA was assessed by a modified version of the Leisure Score Index (LSI; Courneya, Jones, Rhodes, & Blanchard, 2004) from the Godin Leisure Time Exercise Questionnaire (Godin, Jobin, & Bouillon, 1986; Godin & Shephard, 1985). Within each questionnaire pack, participants were asked to recall the average duration (minutes each session) and frequency (times/week) of mild (i.e., minimal effort; easy walking), moderate (i.e., not exhausting; fast walking), and vigorous PA in the last week (i.e., heart beats rapidly; running) that lasted at least 10 minutes and that was done during their leisure/free time. The LSI has compared favourably with other self-reported measures of exercise (Jacobs et al., 1993) and has shown to be an easy tool to administer, as well as valid and reliable (Jacobs et al., 1993). This studied utilized a modified version of the LSI which measured both average duration and frequency of PA at various intensities (Courneya et al., 2004). The modified version was selected to allow for comparisons with the public health PA guidelines. The use of the modified LSI is common within both the PA and cancer literature (Karvinen et al., 2006, 2007b; McGowan et al., 2013; Stevinson et al., 2007; Trinh et al., 2010).

The study pack also contained a short version of the International Physical Activity Questionnaire (IPAQ; International Physical Activity Questionnaire, n.d.). The IPAQ was developed by an International Consensus Group in 1998 and is a tool recommended for national monitoring of PA in adults (Craig et al., 2003; IPAQ, 2005). In contrast to the LSI which is a measure of only leisure-time PA, the IPAQ also assesses occupational activity, active transportation, domestic, and sedentary-related activities. These activities are particularly important when considering Phase II of the study, as accelerometers do not simply measure activity completed during leisure time, but also measure movements associated with other daily activities. To date, studies with cancer survivors have focused only on the association between leisure time PA and QOL, so including these other activity domains will make a new contribution to the literature. The short version of this questionnaire has shown to have good reliability, and its criterion validity has been shown to compare to other self-report questionnaires (Craig et al., 2003).

The PA guidelines of the ACS (Doyle et al., 2006; Schmitz et al., 2010) and the ACSM/American Heart Association (Haskell et al., 2007) were used to identify gynaecologic cancer survivors who were meeting the PA guidelines. These guidelines recommend that individuals engage in 150 minutes of moderate PA, 75 minutes of vigorous PA, or an equivalent combination that doubly weighted the vigorous minutes. Therefore, total moderate-to-vigorous PA (MVPA) for the LSI and the IPAQ was calculated using the following equation: Total MVPA = (moderate PA frequency * moderate PA duration) + 2(vigorous PA frequency * vigorous PA duration). Mild activity is not included within these guidelines so PA measures are consistent with the PA intensities recommended with the ACS recommendations. Using the calculated 'Total MVPA' participants were divided into four groups: 1) completely sedentary (no MVPA); 2) insufficiently active (<150 minutes of MVPA); 3) within guidelines (150 to 299 minutes MVPA); and 4) above guidelines (≥300 minutes of MVPA).

Physical Activity Preferences.

Thirteen-closed item questions were used to gather information about participants' exercise preferences. Similar questions have been used in previous studies to obtain information about exercise preferences (i.e., *what is your preferred location for a physical activity program?* Jones & Courneya, 2002; Karvinen et al., 2006; Vallance et al., 2006), including provincial-wide studies in Alberta of ovarian cancer and endometrial cancer survivors (Karvinen et al., 2006; Stevinson et al., 2009a). The psychometric properties of these questions have not yet been tested.

Quality of Life.

Functional health status and well-being was measured using the Short Form Health Survey version 2 (SF12; Ware, Kosinkski, & Keller, 1996). The SF-12 is a shorter version of the widely used SF-36 that contains a subset of 12 questions to assess functional health from the patient's point of view. The SF-12 assesses functional health and well-being across eight domains: physical functioning (2 items), role-physical functioning (2 items), bodily pain (1 item), general health (1 item), vitality (1 item), social functioning (1 item), role-emotional functioning (2 items) and mental health (2 items). Within this questionnaire, participants are asked to answer questions as they pertain to the way he/she felt or acted '*during the past 7 days'*. The SF-12 produces

psychometrically based summary scores, a physical component summary (PCS) and a mental component summary (MCS), which were derived using the QualityMetric Health Outcomes™ Scoring Software 4.0. A high PCS score (0-100) indicates little or no limitations in physical functioning and role participation due to physical problems, a low degree of bodily pain and good general health. A high MCS score (0-100) indicates positive affect with little or no limitations in social/role activities due to emotional problems. As this survey is a norm-based survey, its scores permit comparisons with other forms of the generic health survey (i.e., SF-36, SF-8). The validity and reliability of the SF-12 is well established (Gandek et al., 1998; Ware et al., 1996). Internal consistencies were calculated for the SF12 subscales that had more than one question: physical functioning (α=0.81), role-physical functioning (α=0.95), role-emotional functioning (α=0.92), and mental health (α=0.78).

Disease specific QOL was measured using the Functional Assessment of Cancer Therapy—General questionnaire (FACT-G; Cella et al., 1993). The FACT-G is a self-report measure of HRQOL which can be used with patients of any tumour type to assess the four primary domains of QOL: physical, social/family, emotional, and functional well-being. The FACT-G consists of 27-items rated on a 5-point likert scale assessing physical (7 items), functional (7 items), emotional (6 items) and social (7 items) well-being subscales. The FACT-G has been shown to be valid, reliable, and easy to administer (Cella et al., 1993). A global or total QOL score can be obtained by summing the scores across the physical, functional, social, and emotional well-being. Total scores can range from 0 to 108, higher scores indicating higher or better QOL. The QOL domains can also produce individual scale scores: physical (PWB, 0-28), functional (FWB, 0-28), emotional (EWB, 0-24), social (SWB, 0-28). At least 50% of the items in each subscale must be completed in order to be considered valid. Likewise 80% of the total FACT-G items must be completed in order for the overall FACT-G subscale to be scored. Internal consistencies for the subscales in the current study were: PWB (α=0.87), SWB (α=0.84), EWB (α=0.73), FWB (α=0.92), and total FACT-G (α=0.94).

3.4.2 Phase II.

Medical and Demographic Variables.

Medical and demographic variables were collected within Phase I so they were not recollected within the Phase II.

Objective Physical Activity.

PA was objectively measured using the Actigraph GT3X accelerometer, which has been shown to be a valid and reliable tool (Metcalf, Curnow, Evans, Voss, & Wilkin, 2000; Plasqui & Westerterp, 2007; Welk, Schaben, & Morrow, 2004). The G3TX activity monitor provides a variety of objective PA measures such as activity counts, steps taken, energy expenditure, activity levels, etc. Briefly, the G3TX monitor can accurately and consistently measure vertical accelerations ranging in magnitude of approximately 0.05 to 2.5 G's. This monitor has a frequency range (0.25 to 2.5 Hz) which enables it to detect normal human motion while rejecting high frequency vibrations from other sources. The GT3X is a lightweight and compact device (3.8 cm x 3.7 cm x 1.8 cm) that was worn on the waist or hip of participants via an elastic belt. The small size of the device makes it extremely convenient as it could be worn under or over clothes without interfering with daily activities. The participants were instructed to wear the accelerometer for nine consecutive days, during all waking hours (i.e., from the time they got up in the morning until the time they went to bed) with the exception of showering or water-based activities (Trost, McIver & Pate, 2005). Nine days was selected as the length of wear-time to account for incomplete days likely occurring on Day 1 and 9 when the accelerometer was distributed and picked up from participants. This allowed for a full 7-day wear time period.

Accelerometer data were first analyzed to identify 'valid' wear days. A day was considered 'valid' if the accelerometer was detected to be worn for a minimum of 600 minutes or 10 hours per day (Colley et al., 2011; Troiano et al, 2008). Non-wear time was defined as a period of at least 60 minutes with no recorded activity (consecutive zeroes). As this study was exploratory in nature, only the days identified to be 'valid' were used in the MVPA calculations with no exemptions based on weekdays or weekends (Eslinger, Copeland, Barnes, & Tremblay, 2005).A 5 second epoch length was set for all accelerometers.

Total MVPA minutes were then calculated using the Freedson adult cut points (Freedson et al., 1998). These cutpoints were selected as they have been used frequently within the literature (Masse et al., 2005). According to these cut points, activity is considered moderate-to-vigorous in intensity when a threshold of 1952 counts per minute is detected by the accelerometer. Consistent with the PA recommendations and calculations conducted by Glazer and colleagues (Glazer et al., 2013), total MVPA minutes was calculated by adding the total minutes of moderate and vigorous activity regardless of bout duration. $MVPA_{+10}$ was calculated by adding moderate and vigorous activity minutes accumulated in bouts of 10 minutes or more. $MVPA_{<10}$ was calculated by adding moderate and vigorous activity accumulated in <10 minutes at a time. The PA guidelines (Doyle et al., 2006; Haskell et al., 2007) were used to identify the proportion of participants who met the ACS PA recommendations.

Subjective Physical Activity.

As in Phase I, self-report PA was assessed by a modified version of the LSI (Godin et al., 1986; Godin & Shephard, 1985) and the IPAQ (IPAQ, n.d.).

Physical Activity Preferences.

PA preferences were assessed via a short (15-20 minute) semi-structured interview lead by the primary investigator. Participants were asked about their PA interests and preferences based on responses obtained from the Phase I survey (see Appendix J). Participants were asked to expand on their responses to assist the researcher in gaining a greater understanding of their responses. The interviews were conducted at a location convenient and comfortable for the participant. The preferred method of data collection was face-to-face interviews, but telephone interviews were used when face-to-face meeting could not be arranged. Participants provided consent and were notified before commencing the interview that the conversation was to be audio recorded with their permission.

Quality of Life.

As in Phase I, QOL was measured using the SF-12 (Ware et al., 1996) and the FACT-G questionnaire (Cella et al., 1993).

3.5 Data Analysis

All data analyses were conducted using the data analysis software SPSS 19 (SPSS Inc., Chicago, IL). Prior to beginning analyses the data was cleaned and examined for missing values and outliers. In addition, the data was evaluated for meeting the required assumptions and criteria for the specific analyses to be carried out.

3.5.1 Sample Characteristics.

Preliminary analyses using frequencies and percentages were used to gather basic demographic and medical characteristics of the study sample. The representativeness of the sample was determined by comparing those who completed the questionnaires with those who did not complete the questionnaires on available information from the Registry.

3.5.2 Objective I: Analytical Plan.

What are the current levels of PA in gynaecologic cancer survivors in Nova Scotia? What is the proportion of gynaecologic cancer survivors who meet the PA recommendations for cancer survivors based on both self-reported and objective PA measures?

Descriptive statistics (mean number of MVPA minutes) were calculated for both the self-report and objective PA measures to assess the current PA levels of participants. Total MVPA minutes were used to categorize the participants into four groups based on the PA recommendations for cancer survivors (Doyle et al., 2006; Haskell et al., 2007; Schmitz et al., 2010). Frequencies and percentages were used to determine the proportion of gynaecologic cancer survivors within the four PA categories.

3.5.3 Objective II: Analytical Plan.

What is the relationship between self-reported PA and QOL, and objectively measured PA and QOL in gynaecologic cancer survivors in Nova Scotia?

Due to the potential for outliers to influence population estimates, outliers, defined as greater than 3 standard deviations from the mean, (Osborne & Overbay, 2004) for measures of PA and QOL were removed from the dataset prior to examining their relationships. Differences in QOL between participants in the four PA categories was tested using analysis of variance (ANOVA) followed by post-hoc comparisons when significant differences were detected. These analyses were repeated using analysis of

covariance (ANCOVA) to control for the demographic and medical variables that had statistically significant associations with the QOL scales. The larger aggregate scales were tested first (FACT-G) followed by smaller subscales (i.e., PWB, SWB) if significant differences were detected.

3.5.4 Objective III: Analytical Plan.

What is the relationship between objectively measured PA and self-reported PA?

The Shapiro-Wilk test of normality was used to determine the distribution of the PA data from the self-report and objective measurements. The data were not normally distributed; as such Spearman correlations were used to assess the association between objectively measured PA and self-reported PA. A two-way mixed intraclass correlation coefficient was used to calculate the level of absolute agreement between the two types of measurements. An estimate of the level of agreement between self-report and objectively measured PA was also assessed using the Bland-Altman method (Bland & Altman, 1986), the standard for assessing agreement between two measures (Zou, 2011). The difference between self-reported total MVPA and objectively measured MVPA was plotted against their averages on a graph to observe their level of agreement.

3.5.5 Objective IV: Analytical Plan.

What are the PA interests and preferences of gynaecologic cancer survivors in Nova Scotia?

Frequencies and percentages were used to determine the PA preferences of gynaecologic cancer survivors. Chi-square analyses were used to examine the association between demographic and/or medical variables (i.e., age) and PA preference (i.e., interested in a program). The medical and demographic variables selected for this study are consistent with those used in previous studies (Karvinen et al., 2006; Trinh et al., 2011b; Vallance et al, 2006). All medical and demographic variables were dichotomized or trichotomized based on clinically relevant cut-points. The demographic variables included age (<60 vs. > 60 years), education (completed high school or less vs. some post-secondary or more), employment status (working vs. not working), annual income (<40,000 vs. > 40, 0000 vs. 'do not wish to say') and marital status (married/common law vs. single/divorced/widowed). The medical variables included months since diagnosis (< 60 vs. > 60 months), disease stage (Stage I/II vs. Stage III/IV), and current treatment

status (not receiving treatment vs. receiving treatment). The moderating effect of exercising regularly was also tested (meeting public health exercise guidelines vs. not meeting guidelines). For these analyses we dichotomized exercise preference items by combining multiple response options. For the preference variables, 'yes' and 'maybe' were combined when the response options were 'yes', 'maybe', or 'no'.

PA preference information obtained from the short semi-structured interviews was transcribed verbatim in a Microsoft Word file by the Principal Investigator. The transcript was checked against the original audio recording for accuracy and all personal identifying information was removed. A content analysis (Hsieh & Shannon, 2005) was used to evaluate the interviews. The main purpose of the interviews was to gain a deeper understanding of women's PA preferences and to identify any major themes. The interviews were categorized according to words, phrases, and sentences that pertained to the specific PA preferences. Frequencies and percentage of responses were used to determine PA preferences and the insight of gynaecologic cancer survivors.

Chapter 4: Results

4.1 Phase I

4.1.1 Sample Characteristics.

A total of 900 eligible gynaecologic cancer survivors were sent the Phase I study pack by CCNS. Of these survivors, 239 returned a completed questionnaire. Twenty-five unopened surveys were returned to CCNS and 299 survivors responded noting they were unwilling to participate, 14 of which refused via telephone. Eight survivors who had been contacted had passed away. There was no contact from the other 329 survivors who received the surveys resulting in a 27.6% completion rate (239/867) and a 62.1% response rate, excluding the wrong addresses and deceased from the denominator (538/867).

Using the data from the Registry, we compared responders (n = 239) and non-responders (n = 661) on the available medical and demographic variables. Responders and non-responders did not differ in terms of mean age (52.91 years vs. 53.12 years; p = .783). However, responders were, on average, 6 months closer to their date of diagnosis than non-responders (76.30 months vs. 82.61 months; p = .013). Moreover, there was a difference in cancer site (p < .001) with responders having lower rates of uterine (51.5% vs. 60.4%) and cervical (24.3% vs. 28.1%) cancer and a higher rate of ovarian (22.6% vs. 10.0%) and other cancers (1.7% vs. 1.5%). There was however no significant difference in the stage of cancer between responders and non-responders (p = .096). Given the limited demographic and medical variables provided by the Registry, self-reported data for the demographic and medical variables were used in the subsequent analyses.

4.1.2 Demographic Characteristics.

The demographic and medical characteristics of the participants are presented in Tables 1 & 2. In brief, the mean age of respondents was 58.54, 68.1% were married/living common-law, 28.3% had completed university/college, and 40.5% were employed (full or part-time status). The medical characteristics indicated that 43.4% were uterine cancer survivors, and 36.5% had Stage I disease. The average number of months since diagnosis was 76.3 or just over 6 years.

4.1.3 Physical Activity and Quality of Life.

Prevalence of Physical Activity.

Descriptive PA and QOL life data are provided in Table 3. Using the LSI, the mean

number of MVPA minutes was 120.67±172.55. On average participants reported 26.38±64.42 minutes of vigorous PA and 70.03±104.38 minutes of moderate PA. Based on the PA guidelines using the leisure time PA data, 48.7% (n = 111) of participants were completely sedentary (CS), 18.9% (n = 43) were insufficiently active (BG), 16.7% (n = 38) were meeting PA guidelines (MG), and 15.8% (n = 36) were exceeding current guidelines (EG).

According to the IPAQ data, the mean number of MVPA minutes was 191.86±302.84. On average participants reported 40.34±101.78 minutes of vigorous PA and 120.01±228.63 minutes of moderate PA. In terms of the percentage of survivors meeting the current PA recommendations, using the IPAQ PA data, 47.6% (n = 110) were CS, 16.5% (n = 38) were BG, 13.9% (n = 32) were MG, and 22.1% (n = 51) were EG.

Relationship with Quality of Life.

The relationship between total duration of MVPA and QOL was first investigated using Pearson product-moment correlations (Table 4). The analysis using the LSI data demonstrated significant small effect size correlations (Cohen, 1988) between duration of PA from the LSI and PWB (r = 0.185; n = 219), FWB (r = 0.181, n = 220), and total FACT-G (r = 0.177; n = 213), with higher levels of MVPA associated with higher QOL scores. Using the SF12 subscales significant medium effect size correlations were found between MVPA from the LSI and PCS (r = 0.364; n = 224). No significant correlations were found between LSI MVPA and MCS. No significant correlations were found between QOL from the FACT and PA when using the IPAQ data and the correlation between IPAQ PA and SF12 demonstrated a significant small effect correlations between PA and PCS (r = 0.135; n = 226).

QOL data by PA category are presented in Tables 4 and 5. ANOVAs using data from the LSI indicated significant associations between PA category and total QOL, FACT-G (p = .041), PWB (p = .007), FWB (p = .017), and PCS (p = <.001). In the follow-up post-hoc tests, we found significantly higher scores for the meeting guidelines group compared with completely sedentary group on PWB (p = .040) and PCS (p = .002).

Additionally, the above guidelines group reported significantly higher scores than the completely sedentary group on PWB (p = .009), FWB (p = .014), total QOL (p = .032) and PCS (p = < .001). ANOVAs for IPAQ indicated significant associations between PA category and PWB (p = .044), SWB (p = .024), and total QOL, FACT-G (p = .032) and PCS (p = .003). In the follow-up post-hoc tests, we found significantly higher scores for the meeting guidelines group compared with completely sedentary group on PWB (p = .041), total QOL (p = .046) and PCS (p = .015). PCS was found to be significantly higher for the above guidelines group compared to the completely sedentary group (p = .014). Significantly higher scores were also found for the meeting guidelines group compared to the insufficiently active group on SWB (p = .041). Analyses were repeated using ANCOVA's to adjust for covariates that had statistically significant correlations with each of the scales. Adjusting for the significant covariates using the LSI did change the results for FWB (age, marital status, received chemotherapy, years since diagnosis; p = .108) and overall QOL (age, marital status, education, received chemotherapy, received radiation, years since diagnosis; p = .210) which were no longer statistically significant. However, adjusting for significant covariates did not have an impact on the physical domains of QOL (age, years since diagnosis). For the IPAQ, adjusting for significant covariates again had an impact on SWB (age, treatment status; p = .353), total QOL (age, marital status, education, received chemotherapy, received radiation, years since diagnosis; p = .317) and PWB (age, years since diagnosis; p = .105), but did not alter the PCS subscale (years since diagnosis; p = .002).

4.1.4 Physical Activity Preferences.

The participants' exercise program preferences are presented in Table 7. Just over one third of the respondents expressed an interest in a PA program (37.4%), with an additional 29.4% stating that they "may" be interested in a PA program. Over three quarters of participants expressed a preference for a home-based program (81.0%) and preferred to participate in a morning program (79.2%). Walking was the preferred activity for 95.4% of the respondents**.** The majority of participants (68.3%) also indicated that they preferred to wait to commence a new program until 3-6 months after the completion of treatment. Despite the clear interest in PA, 93.3% of participants (n = 221) reported that they did not receive or were unsure whether they received any exercise

counselling following their diagnosis. This is a concerning statistic considering 70.1% of the sample (n = 162) indicated they wanted or may have wanted some form of exercise PA counselling.

4.1.5 Moderators of Physical Activity Preferences.

Table 8 summarizes the significant associations between demographic and medical variables and PA preferences. The most consistent associations between demographic and PA preferences variables were age and employment status. Gynaecologic cancer survivors younger than 60 years of age were more interested in a PA program (74.3% vs. 59.8%; $p < .05$) and were more likely to want PA counselling (79.3% vs. 61.7%; $p = .003$) than survivors over 60 years of age (Figure 1). Age differences also showed that younger survivors were more likely to prefer to exercise alone (93.1% vs. 80.0 %; $p < .05$), if exercising with others they were more likely to want to exercise with women with the same cancer (82.9% vs. 66.7%; $p < .05$), were more likely to prefer doing activity in the evening (82.3% vs. 50.0%; $p < .001$) and activities of high intensity (54.2% vs. 26.9%; $p < .05$). Differences in PA preference based on employment status (Figure 2) showed that working survivors were more likely to want PA counselling (78.3% vs. 65.7%; $p < .05$) and more likely to prefer to exercise in the evening (86.8 % vs. 50.0%; $p < .001$), and less likely to prefer to exercise in the morning (79.7% vs. 92.5%; $p < .05$) and the afternoon (70.2% vs. 85.9%; $p < .05$).

The medical variables most consistently associated with PA preferences were the completion of treatment and months since diagnosis. The differences showed that those who had completed treatment (Figure 3) were more likely to prefer exercising alone (88.1 % vs. 62.5 %; $p < .05$), with women (72.8% vs. 14.3 %; $p = .003$), and were more likely to prefer a community center (87% vs. 50%; $p = .004$) compared to those survivors who had not completed their treatments. Women diagnosed within the last 5 years (less than 60 months; Figure 4) were more likely to prefer a cancer specific centre for the location of their exercise (59% vs. 51%; $p < .05$), and more likely to prefer exercise in the morning (94.7% vs. 83.3%; $p < .05$) compared to those women diagnosed more than 5 years ago. These women were also more likely to prefer to start PA during treatment (71.0% vs. 41.9%; $p < .05$) and were more likely to prefer exercise of a high intensity (63.6% vs. 37.2%; $p < .05$).

Whether or not women were meeting the PA guidelines was also found to be associated with PA preference. Using the LSI data, women meeting the PA guidelines were more likely to prefer cycling (76.1% vs. 56.5%; $p = .001$), and yoga (88.0% vs. 67.1%; $p < .01$) compared to women not meeting the PA guidelines. Those survivors meeting the guidelines were also less likely to prefer activities of low intensity (47.1% vs. 86.7%; $p < .001$) and to start a PA program more than 1 year post-treatment (43.8% vs. 77.8%; $p = .001$). Using the IPAQ data, again women meeting the PA guidelines were more likely to prefer yoga (88.1% vs. 70.7%; $p < .05$). These women were also less likely to prefer activities of a low intensity (47.1% vs. 28.2%; $p = .005$).

4.2 PHASE II

4.2.1 Sample Characteristics.

A total of 94 gynaecologic cancer survivors showed interest in participating in Phase II of the study. Of these, 3 were ineligible due to age, 38 were ineligible because they resided outside of the HRM, and 14 were ineligible for both of these reasons. Of the 39 participants who were eligible 5 but did not enrol in the study due to scheduling conflicts and 14 did not respond to the principle investigators telephone or e-mail invitations. Twenty gynaecologic cancer survivors participated in Phase II of the study. One participant did not complete the survey portion of Phase II and had extreme levels of PA on their accelerometer recordings thus was excluded from the PA and QOL analyses (N = 19). Four participants also did not complete the interview portion of this phase (N = 16).

Using collected demographic and medical variables (see Tables 9 and 10), we compared those who were interested in Phase II (n = 94) compared to those who were not interested in Phase II (n = 145). On average, those who were not interested in Phase II were significantly older than those who were interested in Phase II ($F(1, 236) = 7.71$, $p = 0.007$). This difference was anticipated due to the difference in the upper age limit in Phases I and II. These participants also differed in terms of education status (p = 0.044), with participants who were not interested having higher rates of completing high school (17.5% vs. 5.3) and technical school (15.4% vs. 9.6%) than those who were interested in Phase II. There were no differences between participants who participated in Phase II compared to those who showed interest but did not participate (Tables 11 and 12).

4.2.2 Demographic Characteristics.

The demographic and medical characteristics of the 20 Phase II participants are presented in Tables 11 and 12). In brief, the mean age of respondents was 53.85 (SD = 9.79), 16 participants were married/living common-law, 13 had completed some form of post-secondary education, and 12 were currently employed. The medical characteristics show that 6 of the participants were uterine cancer survivors, half of the participants had early stage disease (I/II) and all but one participant had not completed their treatment (N = 19).

4.2.3 Physical Activity and Quality of Life.

Prevalence of Physical Activity.

Descriptive PA and QOL life data are provided in Table 13 and 14. Using the LSI, the mean number of MVPA minutes was 205.00±286.53. On average participants reported 52.37±127.37 minutes of vigorous PA and 100.26±121.42 minutes of moderate PA minutes. Based on the PA guidelines using the leisure time PA data, 31.6% (n = 6) were completely sedentary (CS), 15.8% (n = 3) were insufficiently active (BG), 36.8% (n = 7) were meeting physical activity guidelines (MG), and 15.8% (n = 3) were exceeding current guidelines (EG).

According to the IPAQ data, the mean number of MVPA minutes was 398.95±531.69. On average participants reported 112.11±218.09 minutes of vigorous PA and 174.44±307.83 minutes of moderate PA. In terms of the percentage of survivors meeting the current PA recommendations, using the IPAQ PA data, 42.1% (n = 8) were CS, 10.5% (n = 2) were BG, 10.5% (n = 2) were MG, and 36.8% (n = 7) were EG.

Although 600 minutes of wear time is required for a 'valid day', the average daily wear time was much greater, 781. 23 minutes (SD= 119. 68). On average, participants wore the accelerometer for 5.10 days (SD = 1.73) of the 7-days used for the analysis. According to the accelerometer data participants engaged in a total of 252.18 minutes of MVPA. On average, participants had 83.12 ± 88.39 minutes of $MVPA_{10+}$ and 169.06 ± 113.59 minutes in $MVPA_{<10}$ minutes. In terms of the objective $MVPA_{10+}$, 31.6% of participants (n = 6) were completely sedentary (CS), 47.4% (n = 9) were insufficiently active (BG), 21.1% (n = 4) were meeting physical activity guidelines (MG), and no participants activity exceeded the current guidelines (EG).

Relationship with Quality of Life.

The relationship between $MVPA_{10+}$ and QOL was first investigated using Pearson product-moment correlations. No significant correlations were found, however medium effect size correlations were found between $MVPA_{10+}$ and PWB (r = .352) and the mental component score of the SF12 (r = .372).

QOL data by PA category are presented in Table 15. No significant associations between PA category and QOL using both the FACT-G and SF12 scales were found.

4.2.4 Relationship between Self-Report and Objective Physical Activity Data.

A significant positive correlation was found between the accelerometer data and both the LSI (r = .756, p < .001) and the IPAQ (r = .632, p = .005). The average scores of the $MVPA_{10+}$ data collected using the accelerometer and that collected using the self-report tools were not found to be reliable (LSI ICC= 0.407, CI= -0.339, 0.762 ; IPAQ ICC= 0.196, CI= -0. 542, 0.647). The mean (SD) difference between the amount of $MVPA_{10+}$ between the self-report PA using the LSI and the accelerometer was 133.83 minutes (255.44). The 95% limits of agreement were -377.06 to 644.74 minutes (Figure 5). The mean (SD) difference between the amount of $MVPA_{10+}$ between self-reported PA using the IPAQ and the accelerometer was 338.56 (504.37). The 95% limits of agreement were -670.18 to 1347.30 minutes (Figure 6).

The average scores of moderate PA collected using the accelerometer and that collected using the self-reported PA (LSI ICC= 0.647, CI= -0.196, 0.897; IPAQ ICC= 0.581, CI= -0.127, 0.844) and the vigorous PA from the accelerometer and that collected using the self-reported PA (LSI ICC= 0.610, CI= 0.018, 0.851; IPAQ ICC= 0.252, CI= -0.66, 0.70) were found not to be reliable. Also, total MVPA minutes from the accelerometer and MVPA collected using the self-reported PA also were not reliable (LSI ICC= 0.571, CI= -0.17, 0.841; IPAQ ICC= 0.347, CI= -0.611, 0.748).

4.2.5 Physical Activity Preferences.

Phase II participants' exercise program preferences are presented in Table 16. Twelve of the participants expressed an interest in a PA program (63.2%), with four others reporting that they may be interested (21.1%). Different from Phase I, participants expressed a location preference for a community fitness centre (82.4%), however

morning activity (70.6%) and waiting 3-6 months following treatment completion (68.3%) were again found to be amongst the top preferences. As with Phase I participants, walking was the preferred activity for Phase II respondents (94.4%)**.** Again, despite the high interest in a PA program, all of the Phase II survey respondents (N = 19) indicated that they did not receive any exercise counselling following their cancer diagnosis. This again is an area of great concern considering 18 of the 19 participants indicated that they wanted or may have wanted some form of exercise counselling.

4.2.6 Interviews.

Sixteen interviews were conducted with Phase II participants. Two participants opted to not take part in the interview, and two participants did not respond to the request for an interview. Table 17 provides a summary of the responses.

Physical Activity Information: The Provider, Types and Timing.

During the participant interviews, three topics regarding PA information were discussed: 1) the best provider of the PA information, 2) the type(s) of PA information that should be discussed, and 3) the appropriate timing for a PA discussion.

The Provider.

While a doctor was identified by 3 of the participants to be the person whom they would select to provide them with PA information, many of study participants (81.25%) identified someone other than the doctor to be the person from whom they thought PA information should come from, with a 'counsellor' the most commonly identified role (37.5%). Physicians' demanding schedules were discussed by 6 of the participants and may be reasoning behind the majority of participants identifying someone other than a doctor as ideal for providing PA information. The following quotes are two examples of participants' perspectives of the doctor, recognizing the demands of their work:

> I guess in that case if there were counselling I could see where the surgeon or oncologist wouldn't have time for that. There would have to be a nurse practitioner or somebody else in the mix...another person in the mix.

> I don't think necessarily the doctor's position because they seem to be very busy and I'm sure you know they have a lot more to do.

None of the interviewed women (N = 16) received any PA counselling during their cancer experience and the thought of having someone available to provide this information was not only appealing but important. For some women, the absence of someone whom was readily accessible to answer questions added to the stress of the experience emphasizing the importance of filling such a role:

> Well you know I didn't find that they had a lot of time for answering questions that I did have and they didn't answer them to my satisfaction so therefore I don't think they really had a great interest. I thought it was a matter of 'you have cancer, we will remove your uterus, there you are.

> I think it would be nice, the doctors don't have time for anything and the nurses don't, but if there was a counsellor that like after your doctor's appointment I think it would be good...for a lot of things to have somebody that you could call and say is it alright if I do this or it hurts when I do this and I okay to keep doing it or should I not

Type of information.

The types of PA or exercise information that these individuals may provide was very important to participants. Discussing the appropriate types and amount of PA was the most desired type of information (43.75%). Knowing what is appropriate and safe appears to be important to these women, and could also prevent harm due to lack of such guidance:

> ...that you could have someone to talk to if you wish to about fitness and what other things you could be doing and progressing. So instead I went back to yoga and I did things that were probably dangerous for me to be doing. Like I learned how to do headstands for the first time when I was going through chemo which is really stupid now but then I didn't realize it.

> Well just knowing what sort of activity I should be doing right after the surgery and all that stuff and um what would be healthy and what wouldn't be healthy.

In addition to this information, education around the benefits of PA for cancer survivors and also the services available are important pieces information that these participants identified as needing to be communicated.

Timing of Physical Activity Discussions.

The clinic, during appointments and/or check-ups was the only environment identified during the interviews at which this information should be provided/made available (n = 10, 62.5%). The women's connection with the cancer clinic and their frequent check-ups and follow-ups makes this a desirable location. The post-treatment period was identified by 5 (31.25%) of the participants as the most ideal time for PA discussions. The pre-treatment period was commonly characterized as an overwhelming time when additional information could be 'lost':

> Well I suppose when you're really sick your probably not going to treatment your probably not really that interested in hearing somebody say 'hey you know are you exercising?' or whatever but certainly after your finished all of your treatments and your starting to recuperate and...you know...

> ...you're just getting over your traumatic news and surgery and I don't think you want to be bugged with that. Maybe a year down the road.

Before treatment was identified as an appropriate time for PA counselling for 1 participant, and 2 others identified this information as something that should be readily accessible anytime during the course of treatment.

Interest in a Physical Activity Program.

Consistent with the information collected within Phase I and II surveys, over 75% of the women interviewed showed interest or 'possible' interest in a PA program designed for cancer survivors. When the women were asked what interests them about a

PA program for cancer survivors, social support was the most frequently reported reason (50.0%). While some women did not identify as needing additional support themselves, they did identify a PA program having the potential to provide support to others:

> Like some people need to have that connection with other and they don't have the support. Like for me my church was phenomenal and really helped me. But people don't have that in their lives and they need to have a connection and they need to share then it's so important to have that because sometimes it may not be so much about the physical activity but it may be about the connection with others that is so important.

The PA benefits and the potential distraction a program may provide from the situation were also acknowledged by women as reasons behind their interest in such a program. Also the opportunity to show their support network that they were being active was of interest to one woman.

Factors Influencing Participation.

While interest may be an extremely strong factor influencing women's decision to participate in a PA program, external factors were also identified in the interviews as having an influence in promoting or hindering the women's involvement in a PA program. While the most frequently reported factors of cost and location are consistent with concerns from the general population (Trost et al., 2002), some woman discussed that addressing these factors is of grave importance for people who are dealing with serious illnesses. Ensuring programs are offered in convenient locations is also crucial as requiring these women to travel to programs during times of being unwell is unrealistic and was discussed by two women during their interviews:

> Um during that period of my life unless I had to go to Halifax for a check-up I was living here in [location] so if it was offered within Halifax I definitely would not have been able to participate just because I probably wasn't well enough to travel that much although you know I only had two or three bad days in a row

after the treatments but generally travel wasn't on my radar to go too far from home so I would have wanted something locally.

Um...and uh but I know from other people that I have been around like their energy is just very limited and so it would have to be a convenient a convenience thing because if you had to go all of the way to Halifax to exercise for half an hour...it's a trip when your energy is low.

Time, like location, was the most commonly as having an influence on women's participation in a program (43.75%). Time was a factor enabling some women, as a retired status or flexible work schedules made time available. However, for others busy schedules limited the time they had available to dedicate to a program. Cost was identified by 31.25% of women as an important factor influencing their involvement. Again while this is a concern for many when it comes to PA, the importance of affordable programs is again of vital importance for cancer survivors. One woman identified that the fear of recurrence and the associated worry exacerbates the importance of an affordable program. For another, the risk of another unpaid leave from work further emphasizes the need for affordable programs:

I'm not trying to make it sound like a sob story but you worry about more things like you worry about you know if you had time off work that you know you weren't working that you weren't earning the same income...you know you worry about recurrence right and so you go okay well...you know there all sorts of things for which of course you know I can't get coverage because you know insurance won't and that kind of thing so you start to sort of worry you know not all of the time but on a slightly longer term basis of what if something else happens and income replacement and that kind of thing.

I'm so blessed because I work for [organization] that I have sick time and stuff like that. But a lot of people don't have that and so when they lose their work hours because of their illness they don't have an income some of them and so access to activities is very limited for them.

Program Specifics.

Many of the specifics about a PA program designed for cancer survivors were based on personal preferences. For instance swimming as an activity was obviously more appealing to those who liked water, but not of interest for those who didn't. However, consistent with findings from Phase I and II, walking was most commonly identified as the preferred activity for these women for reasons such as it being easy, allowing conversation, and that its intensity can be modified. Dancing was also identified by 43.75% of women as an activity of interest particularly for the fun associated with it.

Similar to the preferred activity types, the preferred company and environment for a PA program was also based on personal preference. A fitness centre was the most preferred location for women, with home not far behind. While the home is comfortable, convenient and safe, the distractions that can arise and women's reported lack of motivation make exercising outside of the home attractive. There was a consistent preference for group based activities (62.5%) specifically with cancer survivors closer to diagnosis or time of treatment (31.25%). The additional support and camaraderie associated with this group of individuals makes this an obvious choice. While engaging in activities alone allowed for a convenient option, the lack of support particularly closer to diagnosis and treatments was discussed by these women. The preference for supervised scheduled programs is consistent with the survey data in Phase I and II (68.75% for both variables). The additional guidance and motivation that a supervisor/instructor could provide were the two most common reasons for wanting a supervised session. Lastly, the post-treatment time period was identified as the most appropriate time to start an exercise program (62.5%).

Chapter 5: Discussion

5.1 Physical Activity & Quality of Life

One of the primary purposes of this study was to examine the prevalence of PA and its association with QOL in gynaecologic cancer survivors. According to both the LSI and the IPAQ, almost half of gynaecologic cancer survivors in our sample were completely sedentary and approximately one third reported to be either meeting or exceeding the PA guidelines. This level of inactivity is comparable to PA levels reported in other cancer survivor populations including those of endometrial and ovarian cancer survivors (Beesley et al., 2008; Courneya et al., 2005a; Stevinson et al., 2007; Trinh et al., 2011a; Vallance et al., 2011). The consistency of this pattern of inactivity across the two different PA measures used within this study helps to confirm the prevalence and significance of this problem. The high level of sedentary behaviours of gynaecologic cancer survivors were also observed in Phase II. Specifically, PA data collected by the accelerometer showed that only 4 women (21.1%) were meeting the PA guidelines. While firm conclusions cannot be drawn from this small subset of gynaecologic cancer survivors, it does provide additional insight into the prevalence of sedentary behaviour in this population. While lifestyle research is limited in gynaecologic cancer survivors this study does show PA to be linked with important health benefits for gynaecologic cancer survivors, particularly in the realm of QOL ultimately making the low levels of PA problematic.

The main finding of our study is the positive association between PA and QOL in gynaecologic cancer survivors, especially within the physical functioning domain. This again was a pattern captured by both of the PA (LSI and IPAQ) and QOL measures (FACT-G and SF12).With regards to LSI PA and QOL, the insufficiently active, meeting and above guidelines groups were found to have significantly higher scores than the completely sedentary group on physical functioning. The insufficiently active group reported significantly higher scores on PCS (IA>CS = 5.4 points), the meeting guidelines group reported significantly higher scores on the PCS (MG>CS = 8.09 ~~7.78~~ points) and the above guidelines group reported significantly higher scores on both the FACT PWB (AG>CS = 2.82 points) and the SF12 PCS subscales (AG>CS = 11.62 points). These associations appear to be meaningful based on guidelines for minimally important

differences for the FACT in which a two-point difference is identified as being clinically meaningful for subscales, and a five-point difference for the total score (Cella, Hahn, & Dineen, 2002; Cella, Eton, Lai, Peterman, & Merkel, 2002). A benchmark for minimal clinically important difference does not currently exist for the SF-12, but a five-point difference has been identified for the SF-36, and thus was used within this study (Ware, Snow, Kosinski, Gandek, 1993; Angst, Aeschlimann, & Stucki, 2001, Hays & Morales, 2001). As such, the associations between PA and PCS also appear to be clinically meaningful. Despite significant differences not being documented on the other FACT subscales, clinically meaningful differences on FWB and total QOL in favour of the most active group was documented for gynaecologic cancer survivors exceeding the PA recommendations compared to the completely sedentary survivors. Additionally survivors engaging in some type of PA, and those meeting the PA guidelines, reported clinically meaningful higher scores on PWB compared to the completely sedentary group. With regards to IPAQ PA and QOL, survivors who reported to be meeting the PA guidelines or who were above the PA guidelines were found to have significantly higher scores on PCS compared to the completely sedentary group, a difference which is also clinically meaningful (6.52 point difference; 6.77 point difference). Again, despite significant differences not being documented on any of the FACT subscales, the survivors meeting the current PA recommendations reported clinically meaningful differences in PWB and FWB compared to their completely sedentary counterparts. Additionally, the meeting the guidelines group reported clinically meaningful difference in FWB and total QOL compared to those who were insufficiently active.

Data from Phase I of our study suggests that PA has a positive relationship with QOL, particularly in the physical functioning domains. The dose-response pattern between PA and scores of physical functioning is a noteworthy finding and is consistent with established evidence showing that PA has the most benefit in the physical domains of QOL (Belanger et al., 2011; Courneya et al., 2005a; Grimmett, Bridgewater, Steptoe & Wardle, 2011; Karvinen et al., 2007b; Keogh et al., 2010; Lynch et al., 2007; Mandelblatt et al., 2011; Milne et al., 2007; Paxton et al., 2010; Peddle et al., 2008; Stevinson et al., 2007; Trinh et al., 2011a; Vallance et al., 2005). Interestingly, the relationship with physical functioning using the IPAQ data illustrates those survivors who were meeting

the guidelines reported the highest PWB on the FACT followed by those who were exceeding the guidelines. However, the dose-response pattern remained consistent using the PCS of the SF12. While this discrepancy may raise some concerns, it is important to note that the higher QOL scores are still reported by the two most active groups.

Using the PA data from the accelerometers did not illustrate any significant relationships between PA and QOL. Again however there was a consistent pattern for the highest QOL being reported in the cancer survivors whose weekly PA met the PA guidelines. This finding should not be interpreted as proof that PA does not have implications on QOL as the small sample size, and limited representation from active individuals, may have influenced the findings. Importantly, however the persistence of low PA levels should be noted.

While the influence of PA on the social and emotional aspects of QOL is less pronounced, this study did find the more active cancer survivors to consistently report the highest scores across these two dimensions for both the self-report and objective PA data. Previous studies with gynaecologic cancer survivors (Courneya et al., 2005a; Stevinson et al., 2007) and other cancer survivors (Belanger et al., 2011; Karvinen et al., 2007b; Trinh et al., 2011a) have also documented higher social and emotional scores in a physically active group. While this finding provides additional support for the benefits of a physically active lifestyle, a further investigation into why a dose-response pattern is not observed on the psychological scales is warranted. This study found higher social functioning scores in the completely sedentary group compared to the insufficiently active group, and in the case of the LSI, also the meeting the guidelines group. This is not a novel observation (Coups et al., 2009; Vallance et al., 2005) but has not been discussed in these previous studies. Sedentary individuals may be spending their time engaging in other 'social activities' with friends or family which give them a sense of positive social well-being, and permit them to answer in a positive way on the social domains of QOL. However, these 'activities' may well not include PA (i.e., card clubs, family/friend visits, volunteer positions). An investigation into the social supports of sedentary individuals may provide insight into their 'high' social well-being scores.

The evidence for physical benefits of PA for cancer survivors is strong however information into the 'ideal' dose and intensity of PA to achieve optimal QOL does not

exist. In fact, despite the immensity of literature on PA and QOL the absence of a consistent relationship between cancer survivor populations may highlight the need for individualized PA prescriptions or recommendations. For instance, in Belanger and colleagues' work with young adult cancer survivors (2011) a linear improvement in QOL from sedentary survivors to meeting the guidelines was found, with no further QOL improvement attained by survivors exceeding the guidelines. This dose-response relationship was also found in Trinh and colleagues work with kidney cancer survivors (2011a). However, ovarian cancer survivors did not experience any additional benefit from engaging in some PA over their sedentary counterparts, or for exceeding the PA recommendations (Stevinson et al., 2007). In our study, no clear threshold for PA was identified however the QOL benefits associated with higher levels of PA are quite clear.

5.2 Agreement Between Measures

Investigating the agreement between self-report and objective PA measures was a second purpose of this study. The significant positive correlation between the accelerometer with both the LSI and IPAQ may suggest a good relationship between these two types of tools. While a significant correlation between the two measures is the starting point to investigate their level of agreement, it is important to remember that a correlation coefficient only illustrates the linear relationship between the two variables (Bland & Altman, 1986). In fact, poor agreement between the self-report tools and the accelerometer was found when examining the ICC and Bland-Altman analyses, two measures of agreement. According to Portney and Watkins (1993) an ICC of less than 0.75 is considered to denote 'poor to moderate reliability'. As such, both the LSI and IPAQ compared with the accelerometer were found to have poor reliability. The Bland-Altman plots (Figures 5 and 6), particularly the mean differences between the self-report and objective measures, illustrate on average PA to be over-reported by the self-reported measures compared to the accelerometer data. Of the 18 observations using the LSI data, self-reported PA only matched the accelerometer PA in 4 of the observations (PA was overestimated in 11 and underestimated in 3). Of the 18 observations using the IPAQ, self-reported PA matched the accelerometer PA in 5 observations (PA was overestimated in 8 and underestimated in 5). It is important to note that the self-report data only accurately reflected the accelerometer data for women who engaged in no weekly

MVPA. The large span of the 'limits of agreement' displayed in Figures 5 and 6 also illustrate the poor agreement between the self-report and objective PA measures. Both the overestimation and underestimation of PA, particularly by hundreds of minutes, can pose many problems for researchers.

Firstly, it is not surprising that women reported more PA using the IPAQ than on the LSI since the LSI captures only leisure-time PA. However, the fact that the PA data from the accelerometer and the LSI on average had a smaller difference between their PA minutes is quite interesting. Whether or not the LSI is superior to the IPAQ because of the smaller discrepancy in scores should not be up for debate as of yet. Rather the consistent pattern of over-reporting PA should instead raise flags for researchers. Similar patterns of over-reporting have been observed within the general population, and have actually initiated a shift from the use self-report tools to objective tools (Katzmarzyk & Tremblay, 2007). The biases associated with self-report tools (i.e., social desirability, recall) may help to explain the tendency for these women to overestimate their weekly PA. However, the measurement limitations of accelerometers may also be a contributing factor. For instance, the inability of accelerometers to measure water-based activities may explain the lower PA levels. This however is an unlikely explanation considering the small percentage of women who identified swimming as an activity of preference.

Earlier studies which have looked at the agreement between self-report and objective measures in cancer populations, which there are few, have produced inconsistent results (Matthews et al., 2007; Pinto et al., 2005; Rogers et al., 2009a; Sloan et al., 2009; Vallance et al., 2007). As such, future studies which triangulate accelerometer data with PA diaries and/or logs, as well as individual interviews, are necessary to identify if the accelerometer is missing important activity or if other factors can explain the observed difference.

The lack of agreement between the two types of measures, as well as the different PA and QOL patterns reflected when using the objective data, should also highlight the need for future studies with larger sample sizes. The findings from this small sample is consistent with the speculation raised by Troiano and colleagues (1998) in which they hypothesized that incorporating objective PA measures to explore the relation between PA and QOL may yield different relationships. Although no significant differences were

found between the women in the different PA groups, likely due to the small group sizes, the women did report relatively good QOL scores. A larger sample size may yield unique thresholds at which QOL improvements can be achieved for women, however the tendency for more activity to be related with higher QOL is quite consistent.

5.3 Physical Activity Preferences

The present study helped to identify a number of important PA preferences that can help inform PA interventions for gynaecologic cancer survivors. The majority of the Phase I (70.1%) and Phase II (94.8%) gynaecologic cancer survivors expressed an interest in having PA counselling, specifically having it provided 3-6 months following their cancer diagnosis. However, as identified by Vallance and colleagues (2006), despite cancer survivors' 'desire' for PA information, this need is not being met during their care. Recent research suggests that PA is rarely promoted or discussed with cancer survivors during their cancer care (Demark-Wahnefried et al., 2000; Jones & Courneya, 2002). Compared to the 42% identified by Jones and Courneya (2002), a staggering 93.3% of our Phase I study participants and a shocking 100 % (n = 19) of our Phase II participants identified that they did not receive or were unsure whether they received any PA counselling. Both the survey and interview data identify this as an area of cancer care that needs improvement, emphasizing the need for PA counselling to be incorporated into the cancer journey. Stevinson and Fox (2005) suggest that the healthcare team's lack of awareness or familiarity with the PA literature is the primary reason for the lack of PA discussions. In their survey with oncology nurses in the UK, 77% reported 'low' or no familiarity with the PA oncology literature. As such, it appears that healthcare teams and hospitals are not currently equipped to provide cancer survivors the information they desire and that some intervention at this level is warranted. The insight gathered from the one-on-one interviews in conjunction with findings from other studies (Blaney et al., 2013; Jones & Courneya, 2002; Karvinen et al., 2006, 2007c) identify that someone other than the physician or nurse is likely ideal to fill this role. The frequent discussions with participants about the physician being 'busy' and 'not having time' provide the patient perspective of the healthcare team. Since the patients are the people who have frequent interactions with physicians, their opinions should not go unnoticed. Some of the women acknowledged counsellors to be available to address emotional and/or nutritional

concerns, but that a counsellor with exercise knowledge was missing from the healthcare mix. A counsellor with expert PA knowledge, located within the cancer centre, would likely alleviate both the burden that 'busy' physicians would face if they were expected to provide PA counselling. In addition, a PA counsellor would overcome the reported expertise/knowledge issue identified by Stevinson and Fox (2005). Most importantly however, the presence of a PA counsellor would address the patients' needs and desire for a PA expert located in the accessible and frequently visited clinic. While face to face interactions have been identified in earlier studies as the ideal mode for the delivery of PA information (Jones & Courneya, 2002; Karvinen et al., 2006, 2007c), this was the first study to examine the type of PA information cancer survivors would like to have communicated during such an encounter. Guidance around the appropriate type and amount of PA was communicated to be the most desired type of PA information for the women in Phase II of this study. This information in addition to being useful appears to be crucial in ensuring the safety of the patients as some women within their interviews identified engaging in what they imagine were harmful activities. Information about the benefits of PA and the local resources available for cancer survivors is also desired from these women.

While a desire for a PA program is evident, the proportion of gynaecologic cancer survivors who identify as 'not interested' in receiving information or participating in a PA program is still quite concerning (Phase I: 29.9% and 33.2%). This level of disinterest has also been observed in other cancer survivor groups (Stevinson et al., 2009a; Trinh et al., 2011b) and is slightly higher than reported in other studies (Karvinen et al., 2006, 2007c; Vallance et al., 2006). While the reasoning behind this disinterest cannot be identified within this study, it definitely highlights an area for future research to explore. One explanation may be the influence of age on PA interest. In this sample, age was found to have significant influence on interest in a PA program with older survivors being less likely to show interest (59.8 % vs. 74.3%). While this is a pattern evident in other cancer survivor groups (Gjerset et al., 2011a; Jones & Courneya, 2002; Stevinson et al., 2009a) the fact that many gynaecologic cancers are most frequently seen in women over the age of 60 makes this finding one that cannot be overlooked for this population.

This difference alone shows that additional care will likely have to be taken to tailor the PA discussions to meet the unique characteristics of populations.

On a positive note, the majority of gynaecologic cancer survivors in this study express a definite or possible interest in doing a PA program (66.8%) and most (80.6%) felt they were able to participate. Participant interviews identified the physical benefit in addition to the social support a PA program may provide to cancer survivors as the main reasons behind their interest. Enabling cancer survivors to engage in activities that support both their physical and mental health is strong support for the inclusion of PA into cancer care. Studies in other cancer survivor populations have shown similar high levels of interest (Belanger et al., 2011; Demark-Wahnefried et al., 2000; Gjerset et al., 2011a; Jones & Courneya, 2002; Karvinen et al., 2007c; Vallance et al., 2006) including studies with endometrial and ovarian cancer survivors (Karvinen et al., 2006; Stevinson et al., 2009a). One important finding gathered from this study is that PA counselling is clearly important to gynaecologic cancer survivors however does not necessarily translate into an interest in PA programs. The discussions around PA and the program itself are two distinct entities when it comes to PA. PA discussions may be important to promote PA programs for some women, however the discussion may be enough direction for other women who are confident to exercise alone. Either way, this study highlights the importance of incorporating both components into cancer care.

Although interest in a program is important for increasing levels of PA, factors beyond personal preference also play an important role. The influences of side-effects and treatments have been examined in cancer survivors (Brawley, Culos-Reed, Angove, & Hoffman-Goetz, 2002) and were also examined within this study. This study however was the first to investigate the external factors that may influence gynaecologic cancer survivors' ability and decision to participate in a PA program. Time and location of exercise facilities have been identified as having a strong influence on PA levels within the general population (Trost et al., 2002) and were the most common factors identified by the women of this study during their interviews. Providing programs at local exercise centres was suggested by these women as the best way to overcome the location barrier. Providing PA programs in local facilities would also likely decrease the time dedicated to PA by reducing travel time (i.e., traveling to and from activity sessions). As such,

selecting accessible environments for these programs for cancer survivors was noted as being very important. Access however is a multidimensional construct which not only involves transportation/distance, but also cost and the cost of programs was the second most common factor identified by gynaecologic cancer survivors. As a result, free or low-cost programs are also an essential component to facilitate increased PA participation in cancer survivors, by reducing actual and perceived barriers to their participation. While many of these factors are consistent with those identified within the general population, this study's interviews illustrate that the importance of these factors is intensified by the presence of the cancer. For instance, the negative effects of treatments make travel nearly impossible for these women, enhancing the importance of convenient locations particularly if trying to promote PA during treatment. Similarly, the time off work and the possibility for future unemployment with a cancer recurrence creates financial stress and worry for these women emphasizing the importance of affordable programs. As such, the importance of factors such as time, location and cost of PA programs should be considered when developing programs for gynaecologic cancer survivors.

Some clear preferences regarding PA programming did emerge from our sample. The 3-6 month period after treatment was identified by the majority of cancer survivors in both Phases I and II as the preferred time to start a PA program. The post-treatment period is also been preferred in other cancer groups including bladder (Karvinen et al., 2007c), non-Hodgkin's lymphoma (Vallance et al., 2006), kidney (Trinh et al., 2011b), and in a mixed sample of cancer survivors (Jones & Courneya, 2002). The magnitude of this preference within this study is also similar to that reported for endometrial cancer survivors (Karvinen et al., 2006). The overwhelming nature and often short duration of the pre-treatment period appears to be the main reasons against having PA discussions at this time. Two women in Phase II however spoke to the benefits self-initiated PA provided them, during the pre-treatment period preparing their bodies for surgeries/treatments thus aiding in their ability to cope and recover from their cancer. While the time between diagnosis and the start of treatment is not always conducive to commencing a PA routine, discussions around PA should still be provided to enable cancer survivors the opportunity to engage in PA once they feel ready, and was suggested by 3 of the women in their interviews. Though the evidence for PA post-treatment is

strong, the benefits PA can provide during treatment have also been established (Courneya & Friedenreich, 2007). The initial treatment period has been identified as a 'teachable moment' that should receive greater attention. As such PA discussions need not only be incorporated into care visits, but more specifically into the pre-treatment/during treatment visits when feasible and appropriate.

The strong preferences for a morning, home-based, walking program was not surprising as these have been consistently identified across a variety of cancer groups (Belanger et al., 2011; Gjerset et al.. 2011a; Jones & Courneya, 2002; Jones et al., 2007; Karvinen et al., 2006, 2007c; McGowan et al., 2013; Rogers et al., 2009b, 2009c; Stevinson et al., 2009a; Vallance et al., 2006). Phase II interviews found the women to identify walking as easy, modifiable and permitted social interaction (i.e., conversations) perhaps meeting the social support desire previously indicated. Meeting the PA guidelines was the only variable shown to have a significant influence on the preference for activities in this study, with women meeting the guidelines more likely to prefer other activities such as cycling and aerobics, specifically those of higher intensities. The low proportion of gynaecologic cancer survivors who are meeting the PA guidelines, and perhaps walking being perceived as an activity of lower intensity, may explain the high preference for walking in our sample. No other relationship other than personal preference was identified from the interviews for preference towards other activities such as swimming, aerobics, etc. Dancing was an activity that was discussed by 43.75% as an activity of interest during their interviews. To date however no study has explored cancer survivor's preference or desire for dance as a PA activity in a large scale study and perhaps should be included in future studies.

Consistent with Phase I and II, the morning was the most preferred time for PA with energy being the main reason for this preference. In terms of morning PA, an expected trend was observed with employed women less likely to prefer PA programs offered in the morning and afternoon, and more likely to prefer PA in the evening. This finding was consistent with discussions in the interviews, with 4 women identifying the afternoon/evening as a more appropriate time due to work schedules. The influence of employment status on PA preference is not a novel finding (Stevinson et al., 2009a), thus providing programs which meet the needs of both the employed and unemployed is

crucial. The observed influence of age on time of day of activity may also be explained by employment status, as women over the age of 60 are more likely to be retired than those less than 60 years of age, which may also explain the preference for morning of older gynaecologic cancer survivors.

In terms of company, exercising alone appears to be the most popular preference for gynaecologic cancer survivors however friends and family were not far behind. Again the medical status of women particularly their treatment status influenced the preference for exercising alone with those who had not completed treatment less likely to prefer to exercise alone. This pattern is consistent with discussions that took place during the interviews in Phase II as many women identified company to be integral to the early stages of the cancer experience.

Medical characteristics were also found to be important within this study. In Phase I, women who were less than 60 months post-diagnosis were more likely to prefer to start a PA program during treatment compared to those who were further from date of diagnosis. Women closer to diagnosis, perhaps due to more recent memories or continued effects of treatments, may be more able to identify the benefits PA could have or could have had for them during treatments**.** Time since diagnosis also was shown to have an influence on the preference for morning PA in our sample of survivors, with those women closer to diagnoses more likely to prefer the morning than their counterparts. This finding was supported during the interviews with women, with morning being identified as the time of day they had the most energy closer to their diagnosis (n = 3).Women diagnosed with later stage of cancer and those who were diagnosed less than 60 months ago were more likely to identify a cancer specific fitness centre as their location of preference compared to their counterparts. In contrast, kidney cancer survivors less than 60 months since diagnosis were found to be more likely to prefer to engage in PA at the home. While Karvinen and colleagues (2007c) identified treatment related concerns to be a possible explanation for bladder cancer survivor`s preference for exercising at the home, the additional support cancer specific fitness centres may provide for women with aggressive disease or relatively new diagnoses may make exercising outside of the home appealing. Phase II interviews identified exercising with other cancer

survivors as beneficial for people closer to diagnosis (n = 6). The additional support and sense of relatedness was thought to be an excellent addition for this period of time.

This aspect of the study captures the complexity of the PA needs of cancer survivors. While some preferences consistently present themselves within the literature, medical and demographic characteristics often have some influence on the preferences of cancer survivors. As identified by Stevinson et al (2009a) the reasoning behind such variation is unclear however the different results observed for specific populations, and even within populations, emphasize the importance of investigating cancer populations separately versus generalizing the findings. An understanding of the basic needs and wants of cancer survivor groups and the creation of interventions which meet both the common and unique needs, as postulated by theories such as the TPB (Azjen, 1991), will contribute to engagement in behaviour.

5.4 Study Limitations

While this study provides important information there are a number of limitations that

should be considered when interpreting the results, and addressed in future research. As the purpose of the study is clearly outlined for participants prior to consent there is a chance for a self-selected, potentially biased sample. Specifically within both Phase I and II the study may attract gynaecologic cancer survivors who are more active, or more interested in PA, leaving a distinct group unaccounted for which may affect the generalizability of the results. Additionally, this is a Nova Scotian-based study and as such may be limited in its generalizability. Fortunately, this study's findings tend to be quite consistent with previous research in this area, both with other Canadian studies and international research. The cross-sectional nature of Phase I of this study limits any inferences about causation from being made. While the number of randomized-controlled trials is growing, trials which examine PA and QOL particularly in populations like gynaecologic cancer survivors are required. While this study did utilize objective measures of PA which have advantages over subjective measures, the accelerometers used within this study are limited in capturing water based activities providing an inaccurate reading of activity for individuals who engage in a variety of water activities. Future studies that select to use accelerometers should use waterproof devices, or couple

the use of devices with diary data which can capture water activities. Accelerometers are also limited in capturing stationary activities (no accelerations) and weight lifting activities which likely have important implications in the health and well-being of individuals. As such, coupling the use of accelerometers with other data collection methods will likely yield the most accurate results.

Additionally the current 'standard practice' for analyzing PA data suggests only analyzing 'valid' data (Colley et al., 2011; Matthews et al., 2008; Troiano et al, 2008) defined as days with greater than 10 hours of wear-time. This method however can result some weekly PA data being missed on invalid days. These criteria may be particularly problematic for determining the 'level of agreement' between measures, and may help to explain the over-reporting observed on both the self-report tools within this study.

Chapter 6: Conclusion

6.1 Study Significance

Cancer is a disease shown to affect a large number of Canadians. While its diagnosis and treatments can have detrimental consequences for those affected, research evidence supports beneficial improvements in the health and well-being for cancer survivors who are physically active. Regrettably the number of cancer survivors who are sufficiently active to obtain these health benefits is reportedly low. Gynaecologic cancer survivors do not appear to be a unique population of cancer survivors, as the majority of this study's sample reported to have sedentary lifestyles. Again this becomes a problem when physically active lifestyles are linked with lower risks of diseases like cancer, improved disease outcomes for those diagnosed, and improvements in other health-related factors such as QOL.

The evidence linking PA with improvements in QOL have informed the development PA interventions designed for cancer survivors. However, much of this research has relied on self-report measurement tools to assess the PA levels in cancer survivors. While these tools may be sufficient to capture PA of cancer survivors, no investigation has confirmed this. In fact, research within the general population has provided evidence for the contrary. This study was the first to investigate the relationship between different types of self-report PA measures and objective PA measures in gynaecologic cancer survivors. Unfortunately, these preliminary analyses did not provide strong evidence supporting the use of self-report measures, but rather showed large discrepancies in the data collected between the two types of tools and even discrepancies between the two types of self-report measures. In addition, the relationship between PA and QOL was not consistent between two types of tools. While study limitations such as sample size and limitations of accelerometers hinder the development of firm conclusions, these findings clearly illustrate the need for future large-scale studies to investigate the appropriateness of these tools. The ease of administration and low cost of self-report measures will likely help to maintain their status as the 'tool of choice' for large scale studies, but researchers must identify the self-report measure that most accurately reflects the 'true' PA levels of the women. As previously mentioned, the majority of this research to date has relied on self-report tools to collect their data,

specifically the LSI. While the LSI may be more accurate than the IPAQ according to these findings, an average difference of approximately 100 minutes between the data from the LSI and the accelerometer from this study should be a concern. Under and over reporting of PA could lead to errors in the reporting of conclusions and recommendations made about PA duration, frequency and intensity. Despite these obvious concerns the dose-response pattern, although not significant, was maintained in our objective assessment of PA. As such, PA continues to have a connection with positive health outcomes such as QOL.

A key to increasing the PA levels of cancer survivors is to target the underlying motivators for PA, such as PA preferences. PA preferences have been a central focus of current research as they are the cornerstone to the development of interventions successful at increasing PA levels in cancer survivors. To date however the majority of these investigations have been limited by their reliance on closed-item questions to assess cancer survivors' preferences, which provide limited depth and understanding about their needs and preferences for PA programs. This study was the first to use semi-structured interviews to improve our understanding of PA interests and preferences of gynaecologic cancer survivors, providing them an opportunity to expand on their preferences. These interviews while highlighting preferred activities, introduced a new area that had not been asked or captured by the closed-item questions. While the women in this study, similar to other cancer survivor populations, expressed a strong desire to have PA incorporated into their cancer journey, discussions of PA were found to be missing from their experience. There appears to be a disconnect between women's desire and interest in PA and what is reflected in their actual PA behaviours. The key to increasing PA may be to eliminate this gap. The women in this study identified the inclusion of an ex ercise counsellor as ideal, as many recognized the demanding schedules of their physicians made PA discussions impossible. The busy schedules of physicians, in addition to limited PA knowledge, make the inclusion of an exercise specialist important. In addition to informing cancer survivors of available opportunities, these specialists may be able to aid in shifting inactive individuals into active ones. Self-efficacy, perceived barriers and facilitators, attitudes are few things that can influence our behaviours and may be important topics of discussion for women who are contemplating PA. For example,

discussions of the pros and cons of PA and/or accessible and affordable PA opportunities may help a cancer survivor progress from contemplation to preparation or from preparation into action according to the Transtheoretical Model. The availability of an exercise specialist may also permit discussions around self-efficacy, a core construct in human behaviour. These interviews showed the complexity of the cancer journey and the decision to be physically active during it. Ultimately, these interviews highlighted that the incorporation of support personnel, in addition to the development of interventions that are affordable, accessible and meet the interests of cancer survivors, will enable cancer survivors to be active and to obtain the health benefits they deserve.

Ultimately, rigorous research is integral to our effort to increase PA levels in cancer survivors and improve their QOL. And while improvements in chosen measurement tools and methodology will likely aid in our understandings of PA and QOL in cancer survivors, research rooted in theory will be the most useful. Theoretical frameworks provide guides for investigations and intervention/program design, highlighting what constructs can be investigated and in what ways they can influence the behaviours at hand (Courneya et al., 2005; Karvinen et al., 2007; Stevinson et al., 2007; Vallance et al., 2005). However, human behaviour is complex and will likely be best understood using a combination of theories and theoretical components. As identified by Nutbeam and Harris (2004), the level of intervention and the type of behaviour change will determine the theories to be used. Theory-driven research will enable researchers to have the greatest impact on making behaviour change.

6.2 A Health Promotion Perspective

According to the World Health Organization (1986), health promotion is a field concerned with promoting and enabling individuals to have control over their health. A key component of health promotion is preventing the onset of conditions which affect individuals' health and well-being. Health promotion however has a unique role with cancer survivors, in ensuring the same control and opportunities for health and wellness for individuals following a diagnosis of cancer.

6.2.1 Promoting Prevention of Disease Recurrence.

A physically active lifestyle has been shown to provide cancer survivors with important health benefits, specifically contributing to an enhanced well-being. Ensuring

optimal health and well-being during stages of remission and survivorship should remain a priority for health promoters, particularly as the number of cancer survivors continues to grow as our population grows and ages. However, health promoters must also promote PA for its role in reducing the chance of cancer recurrence (Meyerhardt et al., 2006; Schmidt et al., 2013). While optimal health during survivorship is important, improving the odds of disease-free survival is integral for cancer survivors and will also likely contribute to improved health. Reducing the risk of recurrence by increasing PA also means eliminating additional treatments, reducing the experience of the negative symptoms and side-effects as well as eliminating the obvious trauma associated with a cancer recurrence. Ultimately, by eliminating the risk of cancer recurrence health promoters can have positive impact on the health of cancer survivors.

6.2.2 Rigorous Research.

The health and well-being of cancer survivors depends largely on the quality of the research that is generated. While the foundation of evidence to support the development of PA interventions is strong, it has potential to be strengthened with the application of more methodologically sound investigations, potentially aiding in a greater and more accurate understanding of PA and QOL with cancer survivors. Bauman, Phongsavan, Schoeppe, and Owen (2006) suggest "accurate and reliable measurement and monitoring of behaviours…[to be] an important part of health promotion research…" (pp 92), as high quality data is central to the development and implementation of health promotion programs, and is the cornerstone of their effectiveness. To optimally promote and facilitate improvements in health and well-being, health promoters must ensure the production of methodologically rigorous research to serve as the foundation of their interventions. It is this strong foundation which will yield programs optimizing the health and wellbeing of cancer survivors.

6.2.3 Multidisciplinary Strategies.

PA is a complex behaviour, influenced by a variety of factors at a variety of levels. While rigorous research is one way to promote PA in cancer survivors, strategies to overcome physical inactivity must meet the complexity of its determinants. Within the general population there has been a shift away from individual level research and interventions toward a more multidisciplinary and multilevel focus. The development of

task forces spanning different sectors and different levels has enabled health promoters to combat complex problems with complex solutions. It is not unusual that the majority of studies exploring PA and QOL in cancer survivors to date have focused on individual level determinants of PA such as activity preferences, attitudes, perceived barriers, etc. While the number of studies exploring factors beyond the individual (i.e. environments) is on the rise, multidisciplinary and multilevel strategies are also required to combat the physical inactivity crisis within cancer populations. Sallis and colleagues (2006) identified that educating individuals on health and making healthy choices in environments that are not supportive of such decisions will likely produce little effect. Framing interventions and solutions around the Social Ecological Framework (McLeroy, Bibeau, Steckler, & Glanz, 1988) will enable interventions to target not only the individual level determinants, but also the interpersonal, organizational, community and policy factors that also impact PA participation. Most importantly, multilevel multidisciplinary solutions will enable cancer survivors to make health choices in supportive environments.

References

Abayomi, J., Kirwan, J., & Hackett, A. (2009). The prevalence of chronic radiation enteritis following radiotherapy for cervical and endometrial cancer and its impact on quality of life. *European Journal of Oncology Nursing, 13*(4), 262-267.

Abayomi, J., Kirwan, J., & Hackett, A., & Bagnall, G. (2005). A study to investigate women's experiences of radiation enteritis following radiotherapy or cervical cancer. *Journal of Human Nutrition and Dietetics, 18*(5), 353-363.

Abbott-Anderson, K., & Kwekkeboom, K.L. (2011). A systematic review of sexual concerns
reported by gynaecological cancer survivors. *Gynecologic Oncology,* 4(3), 477-489. doi: 10.1016/j.ygyno.2011.11.030

Adams, J., & White, M. (2003). Are activity promotion interventions based on the transtheoretical model effective? A critical review. *British Journal of Sports Medicine, 37*(2), 106-114.

Ahlberg, K., Ekman, T., & Gaston-Johansson, F. (2005). The experience of fatigue, other symptoms and global quality of life during radiotherapy for uterine cancer. *International Journal for Nursing Studies, 42*(4), 377-386.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl, & J. Beckmann (Eds.), *Action control: From cognition to behaviour* (pp. 11). New York: Springer-Verlag.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

Ajzen, I., & Driver, A. (1991). Prediction of leisure participation from behavioural, normative, and control beliefs: An application of the theory of planned behaviour. *Leisure Sciences, 13,* 185-204.

Anderson B.L. (1995). Quality of life for women with gynecologic cancer. *Current Opinion in Obstetrics & Gynecology, 7*, 69-76.

Anderson, B., & Lutgendorf, S. (2000). Quality of life as an outcome measure in gynecologic malignancies. *Current Opinion in Obstetrics & Gynecology, 12*, 21-25.

Andrykowski, M., Beacham, A., Schmidt, J., & Harper, F. W. K. (2006). Application of the theory of planned behavior to understand intentions to engage in physical and psychosocial health behaviors after cancer diagnosis. *Psycho-Oncology, 15*(9), 759-771.

Angst, F., Aeschlimann, A., & Stucki, G. (2001). Smallest detectable and minimal clinically important differences of rehabilitation intervention with their implications for required sample sizes using WOMAC and SF-36 quality of life measurement instruments in patients with osteoarthritis of the lower extremities. *Arthritis & Rheumatism*, *4*, 384-391. doi: 10.1002/1529-0131(200108)45:4<384::AID-ART352>3.0.CO;2-0

Arem, H., Iriwin, M.L., Zhou, Y., Lu, L., Risch, H., & Yu, H. (2011). Physical activity and endometrial cancer in a population-based case-control study. *Cancer Causes and Control, 22*(2), 219-226.

Armitage, C.J., & Conner, M. (2001). Efficacy of Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*, 471-490.

Arriba, L. N., Fader, A. N., Frasure, H. E., & von Gruenigen, V. E. (2010). A review of issues surrounding quality of life among women with ovarian cancer. *Gynecologic Oncology, 11*(2), 390-396. doi:10.1016/j.ygyno.2010.05.014

Audette, C., & Waterman, J. (2010). The sexual health of women after gynecologic malignancy. *Journal of Midwifery and Women's Health, 55*, 357-362.

Bandura, A. (1986). *Social foundations of thought and action*. New Jersey: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (2004). Health Promotion by social cognitive means. *Health Education & Behaviour, 31*(2), 143-164.

Basen-Enquist, K., & Bodurka, D.C. (2007). Medical and psychosocial issues in gynecologic cancer survivors. In P.A. Ganz (Ed.), *Cancer Survivorship* (pp. 114-121). doi: 10.1007/978-0-387-68265-5_10

Basen-Engquist, K., Bodurka-Bevers, D., Fitzgerald, M. A., Webster, K., Cella, D., Hu, S., & Gershenson, D. M. (2001). Reliability and validity of the functional assessment of cancer therapy–ovarian. *Journal of Clinical Oncology, 19*(6), 1809-1817.

Bauman AE, Phongsavan P, Schoeppe S, & Owen N. (2006). Physical activity measurement –
a primer for health promotion. *Health Promotion & Education, 9*(2): 92-103.

Battaglini, C.L. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and hematological cancer survivorship* (pp. 275-304). doi: 10.1007/978-3-642-04231-7

Becker, M., Malafy, T., Bossart, M., Henne, K., Gitsch, G., & Denschlag, D. (2011). Quality of life and sexual functioning in endometrial cancer survivors. *Gynecologic Oncology, 121*(1), 169-173. doi: doi:10.1016/j.ygyno.2010.11.024

Beesley, V. L., Eakin, E. G., Janda, M., & Battistutta, D. (2008). Gynecological cancer survivors' health behaviors and their associations with quality of life. *Cancer Causes Control, 19*(7), 775-782. doi:10.1007/s10552-008-9140-y

Beesley,V.L., Price, M.A., Butow, P.N., Green, A.C., Olsen, C.M., Australian Ovarain Cancer Study Group, …Webb, P.M. (2011). Physical activity in women with ovarian cancer and its association with decreased distress and improved quality of life. *Psycho-Oncology, 20*(11), 1161-1169. doi:10.1002/pon.1834

Belanger, L.J., Plotnikoff, R.C., Clark, A., & Courneya, K.S. (2011). Physical activity and health-related quality of life in young adult cancer survivors: a Canadian provincial survey. *Journal of Cancer Survivorship: Research & Practice, 5*(1), 44-53. doi: 10.1007/s11764-010-0146-6

Bellizzi, K.M., Rowland, J.H., Arora, N.K., Hamilton, A.S., Miller, M.F., & Aziz, N.M. (2009). Physical activity and quality of life in adult survivors of non-Hodgkin's lymphoma. *Journal of Clinical Oncology, 27(6),* 960-966. doi: 10.1200/JCO.2008.17.5026

Biddle, S.J.H., & Fuchs, R. (2009). Exercise psychology: A view from Europe. *Psychology of Sport and Exercise, 10*, 410-419.

Biddle, S., & Mutrie, N. (2008). Physical activity: Why we do, why we don't. In S. Biddle, & N. Mutrie (Eds.), *Psychology of physical activity: Determinants, well-being, and interventions* (pp. 33-160). New York: Routledge.

Bifulco, G., De Rosa, N., Tornesello, M.L., Piccoli, R., Bertrando, A., Lavitola, G., …Nappi, C. (2011). Quality of life, lifestyle behaviour and employment experience: A comparison between young and midlife survivors of gynaecology early stage cancers. *Gynecologic Oncology.* doi: 10.1016/j.ygyno.2011.11.033.

Blanchard, C.M., Courneya, K.S., Rodgers, W.M., & Murnaghan, D. M. (2002). Determinants of exercise intention and behaviour in survivors of breast and prostate cancer: An application of the theory of planned behaviour. *Cancer Nursing, 25*(2), 88-95.

Blanchard, C.M., Courneya, K.S., Stein, K., & American Cancer Society. (2008). Cancer survivors' adherence to lifestyle behavior recommendations and associations with health-related quality of life: results from the American Cancer Society's SCS-II. *Journal of Clinical Oncology, 26*(13), 2198-2204. doi: 10.1200/JCO.2007.14.6217

Blanchard, C.M., Stein, K., & Courneya, K.S. (2010). Body mass index, physical activity and health-related quality of life in cancer survivors. *Medicine & Science in Sports & Exercise, 42*(4), 665-671. doi: 10.1249/MSS.0b013e3181bdc685

Bland, J.M., & Altman, D.G. (1986) Statistical methods for assessing agreement between two methods of clinical measurement. *1*(8476): 307–10.

Blaney, J.M., Lowe-Strong, A., Ranking-Watt, J., Campbell, A., & Gracey, J.H. (2013). Cancer survivors' exercise barriers, facilitators and preferences in the context of fatigue, quality of life and physical activity participation: a questionnaire-survey. *Psycho-Oncology, 22*, 186-194.

Bodurka-Bevers, D., Basen-Engquist, K., Carmack, C.L., Fitzgerald, M.A., Wolf, J.K., de Moor, C., & Gershenson, D.M. (2000). Depression, anxiety and quality of life in patients with epithelial ovarian cancer. *Gynecologic Oncology, 78*(3), 302-308. doi: doi:10.1006/gyno.2000.5908

Bradley, S., Rose, S., Lutgendorf, S., Costanzo, E., & Anderson, B. (2006). Quality of life and mental health in cervical and endometrial cancer survivors. *Gynecologic Oncology, 100*(3), 479-486. doi: 10.1016/j.ygyno.2005.08.023

Brawley, L.R., Culos-Reed, S.N., Angove, J., Hoffman-Goetz, L. (2002). Understanding the barriers to physical activity for individuals with cancer: Review and recommendations. Journal of Psychosocial Oncology, 20, 1-21.

Bridle, C., Riemsma, R. P., Pattenden, J., Sowden, A. J., Mather, L., Watt, I. S., & Walker, A. (2005). Systematic review of the effectiveness of health behavior interventions based on the transtheoretical model. *Psychology & Health, 20*(3), 283-301.

Brown, J. K., Byers, T., Doyle, C., Courneya, K. S., Demark-Wahnefried, W., Kushi, . . . Bloch, A. S. (2003). Nutrition and physical activity during and after cancer treatment: An American Cancer Society guide for informed choices. *A Cancer Journal for Clinicians, 53*(5), 268-291. doi: 10.3322/canjclin.53.5.268

Brown, J.C., Heudo-Medina, T.B., Pescatellom L.S., Pescatello, S.M., Ferrer, R.A., & Johnson, B.T. (2010). Efficacy of exercise interventions in modulating cancer-related fatigue among adult cancer survivors: A meta-analysis. *Cancer Epidemiology, Biomarkers, & Prevention, 20*(1), 123-133. doi: 10/1158/1055-9965.EPI-10-0988

Bunton, R., Baldwin, S. Flynn, D., & Whitelaw, S. (2000). The 'stage of change' model in health promotion: Science and ideology. *Critical Public Health, 10*(1), 55-70.

Burnham, T. R., & Wilcox, A. (2002). Effects of exercise on physiological and psychological variables in cancer survivors. *Medicine & Science in Sports & Exercise, 34*(12), 1863-1867.doi: 10.1249/01.MSS.0000040995.26076.CC

Campo, R.A., Rowland, J.H., Irwin, M.L., Nathan, P.C., Gritz, E.R., & Kinney, A.Y. (2011). Cancer prevention after cancer: changing the paradigm—a report from the American Cancer Society of Preventive Oncology. *Cancer Epidemiology, Biomarkers, & Prevention, 10*, 2317-2324.

Canadian Cancer Society. (2013a). *Canadian Cancer Encyclopedia: Ovarian Cancer overview.* Retrieved from http://info.cancer.ca/cce-ecc/default.aspx?Lang=E&toc=35#

Canadian Cancer Society. (2013b). *Canadian Cancer Encyclopedia: Cervical cancer Overview.* Retrieved from http://info.cancer.ca/cce-ecc/default.aspx?Lang=E&toc=12

Canadian Cancer Society. (2013c). *Canadian Cancer Encyclopedia: Uterine cancer overview.* Retrieved from http://info.cancer.ca/cceecc/default.aspx?Lang=E&toc=53

Canadian Cancer Society. (2013d). *What is ovarian cancer?* Retrieved from http://www.cancer.ca/Canadawide/About%20cancer/Types%20of%20cancer/What%20is%20ovarian%20cancer.aspx

Canadian Cancer Society Steering Committee. (2012). Canadian Cancer Statistics 2012. Toronto: Canadian Cancer Society, 2012.

Canadian Fitness & Lifestyle Research Institute. (2009). *Let's Get Active! 2008 Physical Activity Monitor: Facts and Figures*. Retrieved from http://www.cflri.ca/node/82

Carmichael, A.R., Daley, A.J., Rea, D.W., & Bowden, S.J. (2010). Physical activity and breast cancer outcome: A brief review of evidence, current practice and future direction. *European Journal of Surgical Oncology, 36*(12), 1139-1148. doi: doi:10.1016/j.ejso.2010.09.011

Carter, J., Sonoda, Y., Baser, R.E., Raviv, L., Chi, D.S., Barakat, R.R., . . . Abu-Rustum, N.R. (2010). A 2-year prospective study assessing the emotional, sexual, and quality of life concerns of women undergoing radical trachelectomy versus radical hysterectomy for treatment of early-stage cervical cancer. *Gynecologic Oncology, 199*, 358-365. doi: bv 10.1016/j.ygyno.2010.07.016

Cella, D., Eton, D.T., Lai, J., Peterman, A.H., & Merkel DE. (2002) Combining anchor and distribution based methods to derive minimal clinically important differences on the functional assessment of cancer therapy (FACT) anemia and fatigue scales. *Journal of Pain and Symptom Management, 24*(6), 547-61.

Cella, D., Hahn, E.A., & Dineen, K. (2002). Meaningful change in cancer-specific quality of life scores: Differences between improvement and worsening. *Quality of Life Research, 11*(3):207-221.

Cella, D. F., & Tulsky, D. S. (1993). Quality of life in cancer: Definition, purpose, and method of measurement. *Cancer Investigation, 11*(3), 327-336.

Cella, D. F., & Tulsky, D. S. (1990). Measuring quality of life today: Methodological Aspects. *Oncology, 4*(5), 29-38.

Cella, D. F., Tulsky, D. S., Gray, G., Sarafian, B., Linn, E., Bonomi, A., . . . Harris, J. (1993). The Functional Assessment of Cancer Therapy Scale: Development and validation of the general measure. *Journal of Clinical Oncology, 11*(3), 570-579.

Chan, Y.M., Ngan, H.Y.S., Li, B.Y.G., Yip, A.M.W., Ng., T.Y., Lee, P.W.H., . . . Wong, L.C. (2001). A longitudinal study on quality of life after gynecologic cancer treatment. *Gynecologic Oncology, 83*(1), 10-19. doi:10.1006/gyno.2001.6345

Chase, D.M., Monk, B.J., Wenzel, L.B., & Tewari, K.S. (2008). Supportive care for women with gynecologic cancers. *Expert Review of Anticancer Therapy, 8*(2), 227-241.

Chatzisarantis, N.L.D., & Biddle, J.S.H. (1998). Functional significance of psychological variables that are included in the theory of planned behaviour: A self-determination theory approach to the study of attitudes, subjective norms, perceived behavioural control and intentions. *European Journal of Social Psychology, 28*, 303-322.

Chatzisarantis, N. L. D., & Hagger, M. S. (2009). Effects of an intervention based on self-determination theory on self-reported leisure-time physical activity participation. *Psychology & Health, 24*(1), 29-48.

Chen, X., Lu, W., Zheng, W., Gu, K., Matthews, C., …Shu, O. (2011). Exercise After Diagnosis of breast cancer in association with survival. *Cancer Prevention Research, 4*, 1409-1418. doi: 10.1158/1940-6207.CAPR-10-0355

Chen, X., Zheng, Y., Zheng, W., Gu, K., Chen, Z., Lu, W., & Xiao, S.O. (2009). The effect of regular exercise on quality of life among breast cancer survivors. *American Journal of Epidemiology, 170*(7), 854-862. doi: 10.1093/aje/kwp209

Colley, R.C., Garriguet, D., Janssen, I., Craig, D.L., Clarke, J., & Tremblay, M.S. (2011). *Physical activity of Canadian adults: Accelerometer results from the 2007-2009 Canadian Health Measures Survey* (Statistics Canada, Catalogue no. 82-003-X), *22*(1), 4-11. Retrieved from http://publications.gc.ca/collections/collection_2011/statcan/82-003-X/82-003-x2011001-eng.pdf#page=9

Conn, V. S., Hafdahl, A. R., Porock, D. C., McDaniel, R., & Nielsen, P. J. (2006). A meta-analysis of exercise interventions among people treated for cancer. *Supportive Care in Cancer, 14*(7), 699-712. doi: 10.1007/s00520-005-0905-5

Conner, M., & Armitage, C.J. (1998) Extending the Theory of Planned Behaviour: A review and avenues for further research. *Journal of Applied Social Psychology, 15*, 1429-1464. Conner, M., & Norman, P. (2005). *Predicting Health Behaviour* (pp. 1-27). New York: Open University Press

Conner, M., & Sparks, P. (2005). Theory of planned behaviour and health behaviour. In Conner, M., & Norman, P (Eds.) *Predicting Health Behaviour* (pp. 170-222). New York: Open University Press

Culos-Reed, S.N., Robinson, J.W., Lau, H., Stephenson, L., Keats, M., Norris, S., Kline, G., & Faris, P. (2010). Physical activity for men receiving androgen deprivation therapy for prostate cancer: benefits from a 16-week interventions. *Support Care in Cancer, 18*(5), 591-599. doi: 10.1007/s00520-009-0694-3.

Coups, E.J., Park, B.J., Feinstein, M.B., Steingart, R.M., Egleston, B.L., Wilson, D.J., & Ostroff, J.S. (2009). Physical activity and lung cancer survivorship: Changes across the cancer trajectory and associations with quality of life. *Cancer Epidemiology, Biomarkers, & Prevention, 18*, 664-672. doi: 10.1158/1055-9965.EPI-08-0589

Courneya, K. S. (2003). Exercise in cancer survivors: An overview of research. *Medicine & Science in Sports & Exercise, 35*(11), 1846-1852.

Courneya, K. S. (2009). Physical activity in cancer survivors: A field in motion. *Psycho-Oncology, 18*(4), 337-342. doi: 10.1002/pon.1546

Courneya, K.S., Blanchard, C.M., & Liang, D.M. (2001). Exercise adherence in breast cancer survivors training for a dragon boat racing competition: A preliminary investigation. *Psycho-Oncology, 10*, 444-452.

Courneya, K.S., & Friedenreich, C.M. (1997a). Determinants of exercise during colorectal cancer treatment: an application of the theory of planned behaviour. *Oncology Nursing Forum, 24*(10), 1715-1723.

Courneya, K.S., & Friedenreich, C.M. (1999). Physical exercise and quality of life following a cancer diagnosis: A literature review. *Annals of Behavioural Medicine, 21*(2), 171-179. doi: 10.1007/BF02908298

Courneya, K. S., & Friedenreich, C. M. (1997b). Relationship between exercise pattern across the cancer experience and current quality of life in colorectal cancer survivors. *The Journal of Alternative and Complementary Medicine, 3*(3), 215-226

Courneya, K. S., & Friedenreich, C. M. (1998). Relationship between exercise during treatment and current quality of life among survivors of breast cancer. *Journal of Psychosocial Oncology, 15*(3), 35-57.

Courneya, K. S., & Friedenreich, C. M. (2001). Framework PEACE: An organizational model for examining physical exercise across the cancer experience. *Annals of Behavioral Medicine, 23*(4), 263-272. doi: 10.1207/S15324796ABM2304_5

Courneya, K.S., & Friedenreich, C.M. (2007). Physical activity and cancer control. *Seminars in Oncology Nursing, 23*(4), 242-252. doi: 10.1016/j.soncn.2007.08.002

Courneya, K.S., Friedenreich, C.M., Arthur, K., & Bobick, T.M. (1999). Understanding exercise motivation in colorectal cancer patients: A prospective study using the theory of planned behaviour. *Rehabilitation Psychology, 44*(1), 68-84.

Courneya, K. S., Friedenreich, C. M., Sela, R. A., Quinney, H. A., & Rhodes, R. E. (2002). Correlates of adherence and contamination in a randomized controlled trial of exercise in cancer survivors: An application of the theory of planned behavior and the five factor model of personality. *Annals of Behavioral Medicine, 24*(4), 257-268. doi: 10.1207/S15324796ABM2404_02

Courneya, K.S., Jones, L.W., Rhodes, R.E., & Blanchard, C.M. (2004). Effects of different combinations of intensity categories on self-reported exercise. *Research Quarterly for Exercise & Sport, 75*(4), 429-433.

Courneya, K.S., Keats, M.R., & Turner, R. (2000a). Physical exercise and quality of life in cancer patients following high dose chemotherapy and autologous bone marrow transplantation. *Psycho-Oncology, 9*, 127-136.

Courneya, K.S., Makey, J.R., & Jones, L.W. (2000b). Coping with Cancer. *The Physician and Sports Medicine, 28*(5). Retrieved from http://www.physsportsmed.com/isues/2000/05_00/courneya.htm

Courneya, K. S., Karvinen, K. H., Campbell, K. L., Pearcy, R. G., Dundas, G., Capstick, V., & Tonkin, K. S. (2005a). Associations among exercise, body weight, and quality of life in a population-based sample of endometrial cancer survivors. *Gynecologic Oncology, 97*(2), 422-430. doi:10.1016/j.ygyno.2005.01.007

Courneya, K. S., Vallance, J. K. H., Jones, L. W., & Reiman, T. (2005b). Correlates of exercise intentions in non-Hodgkin's lymphoma survivors: An application of the theory of planned behavior. *Journal of Sport Exercise Psychology, 27*(3), 335-349.

Craft, L.L., Vaniterson, E.H., Helenowski, I.B., Rademaker, A.W., & Courneya, K.S. (2012) Exercise effects on depressive symptoms in cancer survivors: a systematic review and meta-analysis. *Cancer Epidemiology, Biomarkers & Prevention, 21*(1), 3-10. doi: 10.1158/1055-9965.EPI-11-0634

Craig, C.L., Marshall, A.L., Sjostrom, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., …Oja, P. (2003). International Physical Activity Questionnaire: 12-country reliability and validity. *Medicine & Science in Sport & Exercise, 35*(8), 1381-1395.

Cramp, F., & Daniel, J. (2009). Exercise for the management of cancer-related fatigue in adults. *Cochrane Database Systematic Review*, *3*, CD006145

Cramp, F., James, A., & Lambert, J. (2010). The effects of resistance training on quality of life in cancer: a systematic literature review and meta-analysis. *Support Care Cancer, 18*, 1367-1376. doi: 10.1007/s00520-010-0904-z

Cust, A.E. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and gynecologic cancer prevention* (pp. 159-185). doi: 10.1007/978-3-642-04231-7

Cust, A.E., Armstrong, B.K., Friedenreich, C.M., Slimani, N., & Bauman A. (2007) Physical activity and endometrial cancer risk: A review of the current evidence, biologic mechanisms and the quality of physical activity assessment methods. *Cancer Causes Control, 18*, 243-258. doi: 10.1007/s10552-006-0094-7

Davidson, S. (2010). Treatment for advanced cervical cancer: impact on quality of life. *Critical Reviews in Oncology/Hematology, 79*(1), 24-30 doi: 10.1016/j.critrevonc.2010.07.002

Dean, K. (1996). Using theory to guide policy relevant health promotion practice. *Health Promotion International*, *11*, 19-26.

Deci, E.L., Eghrari, H., Patrick, B.C., & Leone, D. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62*, 119–142.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human Behaviour*. New York: Plenum Press.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research*. New York: University of Rochester Press.

Demark-Wahnefried, W., Case, L.D., Blackwell, K., Marcom, P.K., . . .Shaw, E. (2008). Results of a diet/exercise feasibility trail to prevent adverse body composition change in breast cancer patients on adjuvant therapy. *Clinical Breast Cancer, 8*(1), 70-79. doi: 10.3816/CBC.2008.n.005

Demark-Wahnefried, W., Peterson, B., McBride, C., Lipkus, I., & Clipp, E. (2000). Current health behaviours and readiness to pursue life-style changes among men and women diagnosed with early stage prostate and breast carcinomas. *Cancer, 88*(3), 674-684.

Dishman, R.K., Washburn, R.A., & Schoeller, D.A. (2001). Measurement of physical activity. *Quest, 53*, 295-309.

Donnelly, C.M., Blaney, J.M., Lowe-Strong, A., Rankin, J.P., Campbell, A., McCrum-Gardner, E., & Gracey, J.H. (2011). A randomized controlled trial testing the feasibility and efficacy of a physical activity behavioural change intervention in managing fatigue with gynaecologic cancer survivors. *Gynaecologic Oncology, 122*, 618-624. doi:10.1016/j.gyno.2011.05.029

Doyle, C., Kushi, L. H., Byers, T., Courneya, K. S., Demark-Wahnefried, W., Grant, B., . . . Gansler, T. (2006). Nutrition and physical activity during and after cancer treatment: An American Cancer Society guide for informed choices. *A Cancer Journal for Clinicians, 56*(6), 323-353. doi: 10.3322/canjclin.56.6.323

Dillman, D. (1997). *Mail and internet surveys: the tailored design method*. New York: Wiley.

Durante, R., & Ainsworth, B.E. (1996). The recall of physical activity: using a cognitive model of the question-answering process. *Medicine and Science in Sports and Exercise, 28*(10), 1282-91.

Eamus, A., & Thune, I. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and lung cancer prevention* (pp. 101-133). doi: 10.1007/978-3-642-04231-7

Eisemann, M., & Lalos, A. (1999). Psychosocial determinants of well-being in gynecologic
cancer patients. *Cancer Nursing, 22*(4), 303-306.

Ellison, L. F., & Wilkins, K. (2010). *An update on cancer survival.* (Statistics Canada, Catalogue no. 82-003-X), *22*(1), 55-60.

Erekson, E.A., Sung, V.W., DiSilvestro, P.A., & Myers, D.L. (2009). Urinary symptoms and impact on quality of life in women after treatment for endometrial cancer. *International Urogynecoloigcal Journal, 20*(2), 159-163. doi: 10.1007/s00192-008-0755-z

Esliger, D.W., Copeland, J.L., Barnes, J.D., & Tremblay, M.S. (2005). Standardizing and optimizing the use of accelerometer data for free-living physical activity monitoring. *Journal of Physical Activity and Health, 3*, 366–383.

Eslinger, D.W., & Tremblay, M.S. (2007). Physical activity and inactivity profiling: the next generation. *Applied Physiology, Nutrition and Metabolism, 32*, S217-S230. doi: 10.1139/H07-161.

Esrek, M., Ferrell, B. R., Dow, K. H., & Melancon, C. H. (1997). Quality of life in women with ovarian cancer. *Western Journal of Nursing Research, 19*(3), 334-350. doi: 10.1177/019394599701900305

Fernandes, W.C., & Kimura, M. (2010). Health related quality of life of women with cervical cancer. *Revista Latino-Americana de Enfermagem, 18*(3), 360-367.

Ferrell, B., Cullinan, C.A., Ervin, K., Melancon, C., Uman, G.C., & Juarez, G. (2005). Perspectives on the impact of ovarian cancer: Women's views of quality of life. *Oncology Nursing Forum, 32*(6), 1143-1149. doi: 10.1188/05.ONF.1143-1149

Ferrell, B. R., Hassey-Dow, K., & Grant, M. (1995). Measurement of the quality of life in cancer survivors. *Quality of Life Research, 4*(6), 523-531. doi: 10.1007/BF00634747

Ferrer, R.A., Huedo-Medina, T.B., Johnson, B.T., Ryan, S., & Pescatello, L.S. (2011). Exercise interventions for cancer survivors: A meta-analysis of quality of life outcomes. *Annals of Behavioural Medicine, 41*, 32-37. doi: 10.1007/s12160-010-9225-1

Frederick-Recascino, C.M. (2002). Self-determination theory and participation motivation research in the sport context. In E.L. Deci & R.M. Ryan (Eds.), *Handbook of self-determination research*, (pp. 281-294). New York: University Rochester Press.

Freedson, P.S., Melanson, E., & Sirad, J. (1998). Calibration of the Computer Science and Applications, Inc. Accelerometer. *Medicine & Science in Sport and Exercise, 30*(5), 777-781.

Friedenreich, C.M., Neilson, H.K., & Lynch, B.M. (2010). State of the epidemiological evidence on physical activity and cancer prevention. *European Journal of Cancer, 46*, 2593-2604

Friedenreich, C.M., & Orenstein, M.R. (2002). Physical activity and cancer prevention: Etiologic evidence and biologic mechanisms. *The American Society for Nutritional Sciences, 132*(11), 3456S-3464S.

Galvao, D.A., Taafe, D.R., Spry, N., & Newton, R.U. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and genitourinary cancer survivorship* (pp. 217-236). doi: 10.1007/978-3-642-04231-7

Gandek, B., Ware, J.E., Aaronson, N.K., Apolone, G., Bjorner, J.B., Brazier, J.E., . . . Sullivan, M. (1998). Cross-validation of item selection and scoring for the SF-12 Health Survey in nine countries: Results from the IQOLA Project. International Quality of Life Assessment. *Journal of Clinical Epidemiology, 51*, 1171-1178.

Gil, K.M., & von Gruenigen, V.E. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and gynecologic cancer survivorship* (pp. 305-215). doi: 10.1007/978-3-642-04231-7

Gjerset, G.M., Fossa S.D., Courneya, K.S, Skovlund, E., Jacobsoen, A.B., Thornson, L. (2011a). Interest and preferences for exercise counselling and programming among Norwegian cancer survivors. *European Journal of Cancer Care, 20*, 96-105. doi: 10.1111/j.1365-2354.2009.01161.x

Gjerset, G.M., Fossa, S.D., Courneya, K.S., Skovlund, E., & Thorsen, L. (2011b). Exercise behaviour in cancer survivors and associated factors. *Journal of Cancer Survivorship, 5*, 35-43.

Godfrey, A., Conway, R., Meagher, D., & OLaighin, G. (2008). Direct measurement of human movement by accelerometer. *Medical Engineering & Physics, 30*, 1364-1386.

Godin, G., Jobin, J., & Bouillon, J. (1986). Assessment of leisure time exercise behavior by self-report: A concurrent validity study. *Canadian Journal of Public Health. Revue Canadienne De Sante Publique, 77*(5), 359-362.

Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences. Journal Canadien des Sciences Appliquees Au Sport, 10*(3), 141-146.

Goldman K, & Schmalz J. (2001) Theoretically speaking: Overview and summary of key health education theories. *Health Promotion* Practice, *2*, 277-281.

Goncalves, V. (2010). Long-term quality of life in gynecologic cancer survivors. *Current Opinion in Obstetrics and Gynecology, 22*, 30-35.

Granger, C.I., McDonald, C.F., Berney, S., & Denehy, L. (2011). Exercise intervention to improve exercise capacity and health related quality of life for patients with Non-small cell lung cancer: A systematic review. *Lung Cancer, 72*, 139-153. doi: 10/1016/j.lungcan,.2011.01.006

Greimel, E., Thiel, I., Peininger, F., Cegnar, I., & Pongratz, E. (2002). Prospective assessment of quality of life of female cancer patients. *Gynecologic Oncology, 85*, 140-147. doi: 10.1006/gyno.2002.6586

Greimel, E.R., Winter, R., Kapp, K.S., & Haas, J. (2009). Quality of life and sexual functioning after cervical cancer treatment: a long-term follow-up study. *Psycho-Oncology, 18*(1), 476-482. doi: 10.1002/pon.1426

Grimmett, C., Bridgewater, J., Steptoe, A., & Wardle, J. (2011). Lifestyle and quality of life in colorectal cancer survivors. *Quality of Life Research, 20*(8), 1237-1245. doi: 10.1007/s11136-011-9855-1

Hagger, M.S., Chatzisarantis, N.L.D., & Biddle, S.J.H. (2002). A meta-analytic review of the theories of reasoned action and planned behaviour in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport & Exercise Psychology, 24*, 3-32.

Hall, A.E., Boyes, A.W., Bowman, J., Walsh, R.A., James, E.L., & Girgis, A. (2011). Young adult cancer survivors' psychosocial well-being: a cross-sectional study assessing quality of life, unmet needs, and health behaviours. *Support Care Cancer, 20*(6), 1333-1334. doi. 10.1007/s00520-011-1221-x

Hartman, L.C., Loprinzi, C.L., & Gostout, B.S. (2005). *Mayo Clinic Guide to women's cancers.* Rochester: Mayo Clinic.

Haskell, W. L., Lee, I. M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., . .. Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation, 116*(9), 1081-1093. doi: 10.1161/CIRCULATIONAHA.107.185649

Hausenblas, H. A., Carron, A. V., & Mack, D. E. (1997). Application of the theories of reasoned action and planned behavior to exercise behavior: A meta-analysis. *Journal of Sport & Exercise Psychology, 19*(1), 36-51.

Hawkes, A.L., Gollshewski, S., Lynch, B.M., Chambers, S. (2009). A telephone-delivered lifestyle intervention for colorectal cancer survivors 'CanChange': a pilot study. *Pyschooncology, 18*(4), 449-455. doi: 10.1002/pon.1527.

Hays, R.D., & Morales, L.S. (2001). The RAND-36 measure of health-related quality of life. *Annals of Medicine, 33,* 350–357

Herzog, T.J., & Wright, J.D. (2007). The impact of cervical cancer on quality of life—the components and means for management. *Gynecologic Oncology, 107*(3), 572-577. doi:10.1016/j.ygyno.2007.09.019

Hodgkinson, K., Butow, P., Fuchs, A., Hunt, G.E., Stenlake, A., Hobbs, K.M., …Wain, G. (2007). Long-term survival from gynecologic cancer: Psychosocial outcomes, supportive care needs and positive outcomes. *Gynecologic Oncology, 104*(2), 381-389. doi:10.1016/j.ygyno.2006.08.036

Holmes, M.D., Chen, W.Y., Feskanmich, D., Kroenke, C.D., & Colditz, G.A. (2005). Physical Activity and Survival After Breast Cancer Diagnosis. *Journal of the American Medical Association, 293*(20), 2479-2486.

Hsieh, H.F., & Shannon, S.E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277-88.

International Physical Activity Questionnaire. (n.d.). *Questionnaires.* Retrieved from https://sites.google.com/site/theipaq/questionnaires

International Physical Activity Questionnaire. (2005). *Guidelines for data processing and analysis of the international physical activity questionnaire (IPAQ)-short and long forms.* Retrieved from https://sites.google.com/site/theipaq/questionnaires

Irwin, M.L., Cadmus, L., Alvarez-Reeves, M., O'Neil, M., Mierzejewski, E., . . .Mayne, S.T. (2008). Recruiting and retaining breast cancer survivors into a randomized controlled exercise trial: The Yale Exercise and Survivorship study. *Cancer*, *1*(S112), S592-S606. doi: 10.1002/cncr.23446.

Irwin, M. L., Crumley, D., McTiernan, A., Bernstein, L., Baumgartner, R., Gilliland, . . . Ballard-Barbash, R. (2003). Physical activity levels before and after a diagnosis of breast carcinoma. *Cancer, 97*(7), 1746-1757. doi: 10.1002/cncr.11227

Jacobs, D. R., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine & Science in Sports & Exercise, 25*(1), 81-91.

James, A., Campbell, M., DeVellis, B., Reedy, J., Carr, C., & Sandler, R. (2006). Health behavior correlates among colon cancer survivors: NC STRIDES baseline results. *American Journal of Health Behavior, 30*(6), 720-730.

Janda, M., Gebeski, V., Brand, A., Hogg, R., Joblin, T.W., Land, R., . . .Franzcog, A.O. (2010). Quality of life after total laproscopic hysterectomy versus total abdominal hysterectomy for stage I endometrial cancer (LACE): a randomized trial. *The Lancet Oncology, 11*(8), 772-780. doi:10.1016/S1470-2045(10)70145-5

Janz, K.F. (2006). Physical activity in epidemiology: moving from questionnaire to objective measurement. *British Journal of Sports Medicine, 40*, 191-192. doi: 10.1136/bjsm.2005.023036

Johnson, L.H., Breckon, J.D., & Hutchinson, A.J. (2002). Influencing health behaviour: applying theory to practice. In L. Dughill, D.Crone, & R. Murphy (Eds.), *Physical Activity & Health Promotion: Evidence-based apprached to practice* (pp. 21-42). United Kingdom: Wiley-Blackwell.

Jones, L.W. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and lung cancer survivorship* (pp. 255-274). doi: 10.1007/978-3-642-04231-7

Jones, L., & Courneya, K. S. (2002). Exercise counselling and programming preferences of cancer survivors. *Cancer Practice, 10*(4), 208-215. doi: 10.1046/j.1523-5394.2002.104003.x

Jones, L. W., Courneya, K. S., Vallance, J. K., Ladha, A. B., Mant, M. J., Belch, A. R., . . . Reiman, T. (2004). Association between exercise and quality of life in multiple myeloma cancer survivors. *Supportive Care in Cancer, 12*(11), 780-788. doi: 10.1007/s00520-004-0668-4

Jones, L., Courneya, K., Vallance, J. K. H., Ladha, A., Mant, M., Belch, A., & Reiman, T. (2006a). Understanding the determinants of exercise intentions in multiple myeloma cancer survivors: An application of the theory of planned behavior. *Cancer Nursing, 29*(3), 167-175.

Jones, L.W., Guill, B., Keir, S.T., Cater, K., Friedman, H.S., Bigner, D.D., & Reardon, D.A. (2007). Exercise interest and preferences among patients diagnosed with primary brain cancer. *Supportive Care in Cancer, 15*(1), 47-55. doi: 10.1007/s00520-006-0096-8

Jones, G.L., Ledger, W., Bonnett, T.J., Radley, S., Parkinson, N., & Kennedy, S.H. (2006b). The impact of treatment for gynecological cancer on health related quality of life (HRQOL): a systematic review. *American Journal of Obstetrics and Gynecology, 194*(1), 26-42.doi: doi:10.1016/j.ajog.2005.04.060

Kampman, E., Vrieling, A., van Duijnhoven, F.J., & Winkels, R.M. (2012). Impact of diet, body mass index and physical activity on cancer survival. *Current Nutrition Reports*. doi: 10.1007/s13668-011-0004-9

Karvinen, K. H., Courneya, K. S., Campbell, K. L., Pearcey, R. G., Dundas, G., Capstick, V., & Tonkin, K. S. (2006). Exercise preferences of endometrial cancer survivors: A population-based study. *Cancer Nursing, 29*(4), 259-265.

Karvinen, K. H., Courneya, K. S., Campbell, K. L., Pearcey, R. G., Dundas, G., Capstick, V., & Tonkin, K. S. (2007a). Correlates of exercise motivation and behaviour in a population-based sample of endometrial cancer survivors: an application of the Theory of Planned Behaviour. *International Journal of Behavioral Nutrition and Physical Activity, 4*(21). doi: 10.1186/1479-5868-4-21

Karvinen, K. H., Courneya, K. S., North, S., & Venner, P. (2007b). Associations between exercise and quality of life in bladder cancer survivors: A population-based study. *Cancer Epidemiology, Biomarkers Prevention, 16*(5), 984-990. doi: 10.1158/1055-9965.EPI-06-0680

Karvinen, K., Courneya, K., Plotnikoff, R., Spence, J., Venner, P., & North, S. (2009). A prospective study of the determinants of exercise in bladder cancer survivors using the theory of planned behavior. *Supportive Care in Cancer, 17*(2), 171-179.

Karvinen, K. H., & Courneya, K. S., Venner, P., & North, S. (2007c). Exercise programming and counselling preferences in bladder cancer survivors: A population-based study. *Journal of Cancer Survivorship, 1*(1), 27-34. doi: 10.1007/s11764-007-0010-5

Katzmarzyk, P.T., & Tremblay, M.S. (2007). Limitations of Canada's physical activity data: implications for monitoring trends. *Canadian Journal of Public Health, 98*(2), S185-194.

Keats, M.R. (2010, October). Psychosocial correlates of physical activity intentions and behaviour in young and middle age adult cancer survivors: An application of an integrated model. Poster presented at the annual Canadian Society for Psychomotor Learning and Sport Psychology conference, Ottawa, Canada.

Keats, M.R., & Culos-Reed, N. (2009). A theory-driven approach to encourage physical activity in pediatric cancer survivors: A pilot study. *Journal of Sport & Exercise Psychology, 31*, 267-283.

Keats, M.R., Culos-Reed, N., Courneya, K.S., & McBride, M. (2007). Understanding physical activity in adolescent cancer survivors: An application of the theory of planned behaviour. *Psycho-Oncology, 16*, 448-457.

Keller, C., Fleury, J., Gregor-Holt, N., Thompson, T. (1999). Predictive ability of social cognitive theory in exercise research: an integrated literature review. *The Online Journal of Knowledge Synthesis for Nursing, 5*(6), 2

Kendall, A.R., Mahue-Giangreco, M., Carpenter, C.L., Ganz, P.A., & Bernstein, L. (2005). Influence of exercise activity on quality of life in long-term breast cancer survivors. *Quality of Life Research, 14*(2), 361-371. doi: 10.1007/s11136-004-1468-5

Keogh, J.W.L., Shepherd, D., Krageloh, C.U., Ryan, C., Masters, J., Sheperd, G., & MacLeod, R. (2010). Predictors of physical activity and quality of life in New Zealand prostate cancer survivors undergoing androgen-deprivation therapy. *Journal of New Zealand Medical Association, 123*(1325), 20-29.

Knobf, M., Musanti, R., & Dorward, J. (2007). Exercise and quality of life outcomes in patients with cancer. *Seminars in Oncology Nursing, 23*(4) 285-296. doi:10.1016/j.soncn.2007.08.007

Knols, R., Aaronson, N. K., Uebelhart, D., Fransen, J., & Aufdemkampe, G. (2005). Physical exercise in cancer patients during and after medical treatment: A systematic review of randomized and controlled clinical trials. *Journal of Clinical Oncology, 23*(16), 3830-3842. doi: 10.1200/JCO.2005.02.148

Korfage, I.J., Essink-Bot, M-L., Mols., F., van de Poll-Franse, L., Kruitwagen, R., & van Ballegooijen, M. (2008). Health-related quality of life in cervical cancer survivors: a population-based survey. *International Journal of Radiation Oncology, Biology and Physics, 73*(5), 1501-1509. doi:10.1016/j.ijrobp.2008.06.1905

Kwon, S., Hou, N., & Wang, M. (2011). Comparison of physical activity levels between cancer survivors and non-cancer participants in the 2009 BRFSS. *Journal of Cancer Survivorship, 6*(1), 54-62. doi: 10.1007/s11764-011-0204-8

Laws, T. (2001). Mail and internet surveys: The tailored design method. *Contemporary Nurse: A Journal for the Australian Nursing Profession, 10*(3-4), 208.

Leitzmann, M.F. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and genitourinary prevention* (pp. 43-71). doi: 10.1007/978-3-642-04231-7

Li, C., Samsioe, G.M., & Losif, C. (1999). Quality of life in endometrial cancer survivors. *Maturitas, 31*(3), 227-236

Lockwood-Rayerman, S. (2006). Survivorship issues in ovarian cancer: A review. *Oncology Nursing Forum, 33*(3), 553-562. doi: 10.1188/06.ONF.553-562

Loprinzi, P.D., & Cardinal, B.J. (2011). Effects of physical activity on common side effects of breast cancer treatment. *Breast Cancer, 19*(1), 4-10. doi: 10/1007/s12282-011-0292-3

Loprinzi, P.D., Lee, H., & Cardinal, B.J. (2013). Objectively measured physical activity among US cancer survivors: considerations by weight status. *Journal of Cancer Survivorship: Research and Practice*.

Lowe, S. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and palliative cancer care* (pp. 349-365). doi: 10.1007/978-3-642-04231-7

Lowe, S.S., Watanabe, S.M., Baracos, V.E., & Courneya, K.S. (2009). Associations between physical activity and quality of life in cancer patients receiving palliative care: A pilot study. Journal of Pain and Symptom Management, 38(5), 785-796.

Lukowski, J., Gil, K.M., & Jenison, E. (2011). Endometrial cancer survivors' assessment of the benefits of exercise. *Gynecologic Oncology, 124*(3), 426-430. doi: 10.1016/j.ygyno.2011.11.002

Luszcynska, A., & Schwarzer, R. (2005). Social Cognitive Theory. In M. Conner, & P. Norman (Eds.), *Predicting Health Behaviour* (pp. 127-169). New York: Open University Press

Lynch, B. M., Cerin, E., Owen, N., & Aitken, J. F. (2007). Associations of leisure-time physical activity with quality of life in a large, population-based sample of colorectal cancer survivors. *Cancer Causes Control, 18*(7), 735-745. doi: 10.1007/s10552-007-9016-6

Lynch, B. M., Cerin, E., Owen, N., Hawkes, A.L., & Aitken, J. F. (2008). Prospective relationships of physical activity with quality of life among colorectal cancer survivors. *Journal of Clinical Oncology, 26*(27), 4480-4487. doi: 10.1200/JCO.2007.15.7917

Lynch, B.M., Dunstan, D.W., Winkler, E., Healy, G.N., Eakin, E., & Owen, N. (2011). Objectively assessed physical activity, sedentary time and waist circumference among prostate cancer survivors: findings from the National Health and Nutrition Examination Survey (2003-2006). *European Journal of Cancer Care,* 20(4), 514-519. Eur J Cancer Care (doi: 10.1111/j.1365-2354.2010.01205.x.

Lynch, B.M., Dunstan, D.W., Winkler, E., Healy, G.N., Eakin, E., & Owen, N. (2010). Objectively measured physical activity and sedentary time of breast cancer survivors, and associations with adiposity: findings from NHANES (2003-2006). *Cancer Causes & Control, 21*(2), 283-8. doi: 10.1007/s10552-009-9460-6.

Lynch, B.M., Neilson, H.K., Friedenreich, C.M. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and breast cancer prevention* (pp. 13-42). doi: 10.1007/978-3-642-04231-7

Mack, D.E., Sabiston, C.M., McDonough, M.H., Wilson, P.M., & Paskenvich, D.M. (2007). Motivation and behavioural change. In P.R.E. Crocker (Ed.), *Sport and Exercise Psychology: A Canadian Perspective,* (pp 79-110). Toronto: Pearson Canada.

Mandelblatt, J.S., Luta, G., Kwan, M.L., Makgoeng, S.B., Ergas, I.J., Roh, J.M., …Kushi, L.H. (2011). Associations of physical activity with quality of life and functional ability in breast cancer patients during active adjuvant treatment: the Pathways Study. *Breast Cancer Research and Treatment, 129*(2), 521-529. doi: 10.1007/s10549-011-1483-5

Manstead, A. S. R., & van Eekelen, S. A. M. (1998*).* Distinguishing between perceived behavioral control and self-efficacy in the domain of academic intentions and behaviors.
Journal of Applied Social Psychology, 28, 1375-1392.

Marshall, S. J., & Biddle, S. J. H. (2001). The transtheoretical model of behavior change: A meta-analysis of applications to physical activity and exercise. *Annals of Behavioral Medicine, 23*(4), 229-246.

Marcus, B. H., & Simkin, L. P. (1994). The transtheoretical model: Applications to exercise behavior. *Medicine & Science in Sports & Exercise, 26*(11), 1400-1404.

Markland, D., & Ingledw, D.K. (2007). Exercise participation motives: A self-determination theory perspective. In M. Hagger, & N. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 21-34). Illinois: Human Kinetics Publishers.

Masse, L.C., Fuemmeler, B.F., Anderson, C.B., Matthews, C.E., Trost, S.G., Catellier, D.J., & Treuth, M. (2005). Accelerometer data reduction: a comparison of four reduction algorithms on select outcome variables. *Medicine & Science in Sports & Exercise, 37*(11), S544-S554.

Matthews, C.E., Chen, K.Y., Freedson, P.S., Buchowski, M.S., Beech, B.M., Pate, R.R., & Troiano, R.P. (2008). Amount of time spent in sedentary behaviours in the United States, 2003-2004. *American Journal of Epidemiology, 167*(7), 875-881. doi: 10.1093/aje/kwm390. Epub 2008 Feb 25.

Matthews, C.E., Wilcox, S., Hanby, C.L., Der Ananian, C., Heiney, S.P.,. . . Shintani, A. (2007). Evaluation of a 12-week home based walking intervention for breast cancer survivors. *Support Care in Cancer, 15*, 203-211. doi: 10.1007/s00520-006-0122-x

McGowan E. L., Speed-Andrews, A. E., Blanchard, C. M., Rhodes, R. E., Friedenreich, C. M., Culos-Reed, S. N., & Courneya, K. S. (2013). Physical Activity Preferences among a Population-Based Sample of Colorectal Cancer Survivors. Oncology Nursing Forum, 40(1), 44-52. doi: 10.1188/13.ONF.44-52.

McLeroy, K.R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*. *15*: 351-77.

Metcalf, B., Curnow, J., Evans, C., Voss, L., & Wilkin, T. (2004). Technical reliability of the CSA activity monitor: The early bird study. *Medicine and Science in Sports and Exercise, 34*(9), 1533-1537.

Meyer, T.J., & Mark, M.M. (1995). Effects of psychosocial interventions with adult cancer patients: A meta-analysis of randomized experiments. *Health Psychology, 14*, 101-108.

Meyerhardt, J.A., Giovannuci, E.L., Holmes, M.D., Chan, A.T., Colditz, G.A., & Fuchs, C.S. (2006a). Physical activity and survival after colorectal cancer diagnosis. *Journal of Clinical Oncology, 24*(22), 3527-2524. doi: 10.1200/JCO.2006.06.0855

Meyerhardt, J.A. Heseltine, D., Niedzwiecki, D., Saltz, L.B., Mayer, R.J., Thomas, J., . . . Fuchs, C.S. (2006b). Impact of physical activity on cancer recurrence and survival in patients with stage II colon cancer: findings from CALGB 89803. *Journal of Clinical Oncology, 24*(22), 3535-3541. doi: 10.1200/JCO.2006.06.0863

Milne, H.M., Gordon, A., Guilfoyle, A., Wallman, K.E., & Courneya, K.S. (2007). Association between physical activity and quality of life among Western Australian breast cancer survivors. *Psycho-Oncology, 16*, 1059-1068. doi: 10.1002/pon.1211

Milne, H., Wallman, K., Guilfoyle, A., Gordon, S., & Courneya, K. (2008). Self-determination
theory and physical activity among breast cancer survivors. *Journal of Sport Exercise Psychology, 30*(1), 23-38.

Mishra, S.I., Scherer, R.W., Geigle, P.M., Berlanstein, D.R., Topaloglu, O., Gotay, C.C., & Snyder, C. (2012a). Exercise interventions on health-related quality of life for cancer survivors. *Cochrane Database of Systematic Reviews 2012,* Issue 8. Art. No: CD007566. doi: 10.1002/14651858.CD007566.pub2

Mishra, S.I., Scherer, R.W., Geigle, P.M., Berlanstein, D.R., Topaloglu, O., Gotay, C.C., & Snyder, C. (2012b). Exercise interventions on health-related quality of life of people with cancer during active treatment. Cochrane Database of Systematic Reviews 2012, Issue 8. Art. No: CD008465. doi: 10.1002/14651858.CD008465.pub2

Monnikhof, E., Sjoerd, G., Femk, V.A., van der Tweel, I., Schuit, A., Voskuil, D.W., & van Leeuwen, F.E. (2007). Physical activity and breast cancer: a systematic review. *Epidemiology, 18*(1), 137-257. doi: 10.1097/01.ede.0000251167.75581.98

Moorman, P.G., Jones, L.W., Akushevich, L., & Schildkraut, J.M. (2011). Recreational physical activity and ovarian cancer risk and survival. *Annals of Epidemiology, 21*(3)*,* 178-187. doi:10.1016/j.annepidem.2010.10.014

Morey, M.C., Snyder, D.C., Sloane, R., Cohen, H.J., Peterson, B., . . . Demark-Wahnefried, W. (2009). Effects of home-based diet and exercise on functional outcomes among older, overweight long-term cancer survivors: RENEW: a randomized controlled trial. *The Journal of the American Medical Association, 301*(18), 1883-1891. doi: 10.1001/jama.2009.643

Murnane, A., Geary, B., & Milne, D. (2012). The exercise programming preferences and activity levels of cancer patients undergoing radiotherapy treatment. *Support Care in Cancer, 20*(5), 957-962. doi:10.1007/s00520-011-1167-z

Mustian, K. M., Sprod, L. K., Palesh, O. G., Peppone, L. J., Janelsins, M. C., Mohile, S. G., & Carroll, J. (2009). Exercise for the management of side effects and quality of life among cancer survivors. *Current Sports Medicine Reports, 8*(6), 325-330. doi: 10.1249/JSR.0b013e3181c22324

National Cancer Institute (n.d.). *Gatrointestinal Complications.* Retrieved from http://www.cancer.gov/cancertopics/pdq/supportivecare/gastrointestinalcomplications/Patient/page7

Newton, M.J., Hayes, S.C., Janda, M., Webb, P.M., Obermair, A., Eakin, E.G., … Beesley, V.L. (2011). Safety, feasibility and effects of an individualised walking intervention for women undergoing chemotherapy for ovarian cancer: a pilot study. *Biomed Central, 11*, 389. doi: 10.1186/1471-2407-11-389.

Nigg, C.R., Allegrante, J.P., & Ory, M. (2002). Theory-comparison and multiple-behaviour research: common themes advancing health behaviour research. *Health Education Research, 17*(5), 670-779.

Nout, R.A., Putter, H., Jurgenliemk-Schultz, I.M., Jobsen, J.J., Lutgens, L.C.H.W., van der Steen-Banasik, E.M., . . . Creutzberg, C.L. (2009). Quality of life after pelvic radiotherapy or vaginal brachytherapy for endometrial cancer: First results of the randomized PORTEC-2 Trial. *Journal of Clinical Oncology, 27*(21), 3547-3556. doi: 10.1200/JCO.2008.20.2424

Nutbeam, D., & Harris, E. (2004). Theories on health behaviour and health behaviour change: individual characteristics. *Theory in a Nutshell: A practical guide to health promotion theories* (pp. 1-9). Australia: McGraw-Hill

Oechsle, K., Jensen, W., Schmidt, T., Reer, R., Braumann, K-M., de Wit, M., & Bokemeyer, C. (2011). Physical activity, quality of life and the interest in physical exercise programs in patients undergoing palliative chemotherapy. *Supportive Care in Cancer, 19*(5), 613-619. doi:10.1007/s00520-010-0862-5

Olsen, C.M., Bain, C,J., Jordan, S.J., Nagle, C.M., Green, A.C., Whiteman, D.C., &Webb, M. (2007). Recreation physical activity and epithelial ovarian cancer: a case-control study, systematic review and meta-analysis. *Cancer, Epidemiology Biomarkers& Prevention, 16,* 2321. doi: 10.1158/1055-9965.EPI-07-0566

Okun, M.A., Karoly, P., & Lutz, R. (2002). Clarifying the contribution of subjective norm to predicting leisure-time exercise. *American Journal of Health Behaviour, 26*(4), 296-305.

Ovarian Cancer Canada. (2013). *Detecting ovarian cancer.* Retrieved from http://www.ovariancanada.org/

Osborne, J.W., & Overbay, A. (2004). The power of outliers (and why researchers should always check for them. *Practical Assessment, Research & Evaluation, 9*(6). Retrieved from http://pareonline.net/getvn.asp?v=9&n=6

Ozaras, G., & Ozyurda, F. (2010). Quality of life and influencing factors in patients with gynaecologic cancer diagnosis at Gazi University, Turkey. *Asian Pacific Journal of Cancer Prevention, 11*, 1403-1408

Palomba, S., Falboa, A., Mocciaro, R., Russo, T., & Zullo, F. (2009). Laparoscopic treatment for endometrial cancer: A meta-analysis of randomized controlled trials. *Gynecologic Oncology, 112*(2), 415-421. doi:10.1016/j.ygyno.2008.09.014

Paxton, R.J., Jones, L.W., Rosoff, P.M., Bonner, M., Ater, J.L., & Demark-Wahnefried, W. (2010). Associations between leisure-time physical activity and health-related quality of life among adolescent and adult survivors of childhood cancers. *Psychooncology, 19*(9), 997-1003. doi: 10.1002/pon.1654

Pearman, T. (2003). Quality of life and psychosocial adjustment in gynecologic cancer survivors. *Health and Quality of life Outcomes, 1*, 33-339

Peddle, C.J., Au, H-J., & Courneya, K. (2008). Associations between exercise, quality of life, and fatigue in colorectal cancer survivors. *Disease of the Colon & the Rectum, 51*(8), 1243-1248. doi: 10.1007/s10350-008-9324-2

Pekmezi, D.W., & Demark-Wahnefried, W. (2011). Updated evidence in support of diet and exercise interventions in cancer survivors. *Acta Oncologica, 50*(2), 167-178. doi:10.3109/0284186X.2010.529822

Pignanta, S., Ballatori, E., Favalli, G., & Scambia, G. (2001). Quality of life: Gnaecological cancers. *Annals of Oncology, 12*(3), S37-S42. doi: 10.1093/annonc/12.supple_3.S37

Pinto, B.M., & Ciccolo, J.T. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity motivation and cancer survivorship* (pp. 365-385). doi: 10.1007/978-3-642-04231-7

Pinto, B. M., & Floyd, A. (2008). Theories underlying health promotion interventions among cancer survivors. Paper presented at the *Seminars in Oncology Nursing, 24*(3), 153-163.

Pinto, B. M., Frierson, G. M., Rabin, C., Trunzo, J. J., & Marcus, B. H. (2005). Home-based physical activity intervention for breast cancer patients. *Journal of Clinical Oncology, 23*(15), 3577-3587. doi: 10.1200/JCO.2005.03.080

Pinto, B.M., Maryuama, N.C., Clark, M.M., Cruess, D.G., Park, E., & Roberts, M.S. (2002). *Mayo Clinic Proceedings, 77*(2), 122-129.

Pinto, B.M., Papandonatos, G.D., Goldstein, M.G., Marcus, B.H., & Farrell, N. (2013). Home-based physical activity intervention for colorectal cancer survivors. *Psycho-Oncology, 22*, 54-64.

Plasqui, G., & Westerterp, K.R. (2007). Physical activity assessment with accelerometers: An evaluation against doubly labelled water. *Obesity, 15*(10), 2371-2379.

Portney, L.G. & Watkins, M.P. (1993). Foundations of Clinical Research: applications to practice. Prentice Hall Health

Prince, S.A., Adamo, K.B., Hamel, M.E., Hardt, J., Gorber, S.C., & Tremblay, M. (2008). A comparison of direct versus self-report measures of for assessing physical activity in adults: a systematic review. *International Journal of Behavioural Nutrition and Physical Activity, 5*(56). doi : 10.1186/1479-5868-5-56

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*(3), 390-395.

Prochaska, J.O., DiClemente, C.C., & Norcross, J.C. (1992). In search of how people change: Applications to addictive behaviours. *American Psychologist, 47*(9), 1102-1114.

Quist, M., Rorth, M., Langer, S., Jones, L.W., Lauresen, J.H., Papport, H., …Adamsen, L. (2011). Safety and feasibility of a combined exercise intervention for inoperable lung cancer patients undergoing chemotherapy: a pilot study. *Lung Cancer, 75*(2), 203-208. doi: 10.1016/j.lungcan.2011.07.006

Rannestad, T., Skjeldestad, F.E., Platou, T.F., & Hagen, B. (2008). Quality of life among long-term gynaecological cancer survivors. *Scandinavian Journal of Caring Science, 22*(3), 472-477. doi: 10.1111/j.1471-6712.2007.00557.x

Reis, N., Beji, N.K., & Coskun, A. (2010). Quality of life and sexual functioning in gynaecological cancer patients: results from quantitative and qualitative data. *European Journal of Oncology Nursing, 14*(2), 137-146.

Reno, R.R., Cialdini, R.B., & Kallgren, C.A. (1993). The transsituational influence of social norms. *Journal of Personal Social Psychology, 64*, 104-112.

Rhodes, R.E., Blanchard, C.M., Matheson, D.H. (2006). A multicomponent model of theory of planned behaviour. *British Journal of Health Psychology, 11,* 119-137.

Rhodes, R.E., & Courneya, K.S. (2003). Investigating multiple components of attitude, subjective norm, and perceived behavioural control: An examination of the theory of planned behaviour in the exercise domain. *British Journal of Social Psychology, 42*, 129-146.

Rogers, L.Q. (2010). Objective monitoring of physical activity after a cancer diagnosis: challenges and opportunities for enhancing cancer control. *Physical Therapy Reviews, 15*(3), 224-237.

Rogers, L.Q., Hopkins-Price, P., Vicari, S., Pamenter, R., Courneya, K.S., . . . Lowy, M. (2009). A randomized trial to increase physical activity in breast cancer survivors. *Medicine & Science in Sports & Exercise, 41*(4), 935-946. doi: 10.1249/MSS.0b013e31818e0e1b.

Rogers, L. Q., Matevey, C., Hopkins-Price, P., Shah, P., Dunnington, G., & Courneya, K. S. (2004). Exploring social cognitive theory constructs for promoting exercise among breast cancer patients. *Cancer Nursing, 27*(6), 462-473.

Robertson, L., Richards, R., Egan, R., & Szymlek-Gay, E.A. (2012). Promotion and support of physical activity among cancer survivors: a service provider perspective. *Psycho-Oncology, 22*(2), 441-446. doi: 10.1002/pon.3032

Rogers, L.Q., Courneya, K.S., Robbins, K.T., Malone, J., Seiz, A., Koch, L., Rao, K., & Nagarkar, M. (2006). Physical activity and quality of life in head and neck cancer survivors. *Support Care Cancer, 14*(10), 1012-1019. doi: 10.1007/s00520-006-0044-7

Rogers, L.Q., Hopkins-Price, P., Vicari, S., Pamenter, R., Courneya, K.S., . . . Lowy, M. (2009a). A randomized trial to increase physical activity in breast cancer survivors. *Medicine & Science in Sports & Exercise, 41*(4), 935-946. doi: 10.1249/MSS.0b013e31818e0e1b

Rogers, L.Q., Malone, J., Rao, K., Courneya, K.S., Fogleman, A., Tippy, A., . . . Robbins, T. (2009b). Exercise preferences among patients with head and neck cancer: Prevalence and associations with quality of life, symptom severity, depression and rural residence. *Head & Neck, 31*(8), 994-1105. doi: 10.1002/hed.21053

Rogers, L.Q., Markwell, S.J., Verhulst, S., McAuley, E., & Courneya, K.S. (2009c). Rural breast cancer survivors: exercise preferences and their determinants. *Psycho-Oncology, 18*, 412-421. doi: 10.1002/pon.1497

Rogers, L. Q., Shah, P., Dunnington, G., Greive, A., Shanmugham, A., Dawson, B., & Courneya, K. S. (2005). Social cognitive theory and physical activity during breast cancer treatment. *Oncology Nursing Forum, 32*(4), 807-815.

Rossing, M.A., Cushing-Haugen, K.L., Wicklund, K.G., Doherty, J.A., & Weiss, N.S. (2010). Recreational physical activity and risk of epithelial ovarian cancer. *Cancer Causes Control, 21*(4), 485-491. doi: 10.1007/s10552-009-9479-8

Rubin, H.J., & Rubin, I. (2012) Qualitative Interviewing: The Art of Hearing People/ *(3rd edition). Sage, USA*

Ryan, R.M., & Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78.

Ryan, R.M., & Deci, E.L. (2007). Active human nature: Self-determination theory and the promotion and maintenance of sport, exercise and health. In In M. Hagger, & N. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport (pp 1-20)*. Illinois: Human Kinetics Publishers.

Ryan, M., White, K., Roydhouse, J.K., & Fethney, J. (2011). A description of the nutritional status and quality of life of Australian gynaecologic cancer patients over time. *European Journal of Oncology Nursing, 16*(5), 453-459 .doi: 10.1016/j.ejon.2011.10.007

Sallis, J. F., W. L. Haskell, P. D. Wood, et al. (1985) Physical activity assessment methodology in the five-city project. *American Journal of Epidemiology*, 121, 91-106.

Sallis, J., Owen, N., & Fisher, E. (2008). Ecological models of health behavior. In K. Glanz, B. Rimer., & K, Viswanath K (Eds.) H*ealth behavior and health education: theory, research, and practice.* United States: Jossey-Bass.

Sallis, J.F., & Saelens, B.E. (2000). Assessment of physical activity by self-report: Status, limitations, and future direction. *Research Quarterly for Exercise and Sport, 71*(4), S1-14.

Saxton, J., & Delay, A. (2010). Introduction. In J. Saxton, & A. Delay (Eds.), *Exercise and cancer survivorship: Impact on health outcomes and quality of life* (pp. 1-17). New York: Springer.

Schmidt, M.E., Chang-Claude, J., Vrieling, A., Seibold, P., Heinz, J., Obi, N., ...Steindorf, K. (2013). Association of pre-diagnosis physical activity with recurrence and mortality among women with breast cancer. *International Journal of Cancer*. doi: 10.1002/ijc.28130

Schmitz, K. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and breast cancer survivorship* (pp. 189-215). doi: 10.1007/978-3-642-04231-7

Schmitz, K.H., Courneya, K.S., Matthews, C., Demark-Wahnefried, W., Galvao, D.A., Pinto, B.M.,…Schwartz, A.L. (2010). American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Medicine & Science in Sport & Exercise, 42*(7), 1409-1426. doi: 10.1249/MSS.0b013e3181e0c112

Schmitz, K. H., Holtzman, J., Courneya, K. S., Masse, L. C., Duval, S., & Kane, R. (2005). Controlled physical activity trials in cancer survivors: A systematic review and meta-analysis. *Cancer Epidemiology, Biomarkers Prevention, 14*(7), 1588-1595. doi: 10.1158/1055-9965.EPI-04-0703

Seller, C.M., & Courneya, K.S. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and gastrointesitinal cancer survivorship* (pp. 237-253). doi: 10.1007/978-3-642-04231-7

Sheppard, R.J. (2003). Limits to the measurement of habitual physical activity by questionnaires. *British Journal of Sports and Medicine, 37*, 197-206. doi:10.1136/bjsm.37.3.197

Shields M, Tremblay MS, Laviolette M, Craig, C.L., Janssen, I., & Gorber, S.C. (2010). Fitness of Canadian adults: Results from the 2007-2009 Canadian Health Measures Survey. *Health Reports* (Statistics Canada, Catalogue 82-003), *21*(1), 1-15

Slattery, M.L. (2004). Physical activity and colorectal cancer. *Sports Medicine, 34*(4), 239-252.

Slattery, M. L., & Jacobs, D.R., (1995). Assessment of ability to recall physical activity of several years ago. *Annals Epidemiology,* 5, 292-296.

Sloane, R., Snyder, D.C., Demark-Wahnefried, W., Lobach, D., & Kraus, W.E. (2009). Comparing the 7-daye physical activity recall with a triaxial accelerometer for measure time in exercise. *Medicine & Science in Sports & Exercise, 41*(6), 1334-1340. doi: 10.1249/MSS.0b013e3181984fa8.

Speck, R.M., Courneya, K.S., Masse, L.C., Duval, S., Schmitz, K.H. (2010). An update of controlled physical activity trials in cancer survivors. A systematic review and meta-analysis. *Journal of Cancer Survivorship, 4*(2)*,* 87-100. doi: 10.1007/s11764-009-0110-5

Spence, R.R., Heesch, K.C., & Brown, W.J. (2010). Exercise and cancer rehabilitation: A systematic review. *Cancer Treatment Reviews, 36*(4), 185-194. doi:10.1016/j.ctrv.2009.11.003

Spencer, L. , Adams, T.B., Malone, S., Roy, L., & Yost, E. (2006). Applying the transtheoretical model to exercise: A systematic and comprehensive review of the literature. *Health Promotion Practice, 7*(4), 428-442. doi: 10.1177/1524839905278900

SPSS Version 19 [Computer software]. (2010). Chicago, IL: SPSS Inc.

Statistics Canada (2010). *Physical Activity During Leisure Time, 2009* (Catalogue 82-625). Retrieved from http://statcan.gc.ca/pub/82-625-x/2010002/article/11267-eng.htm.

Stevinson, C., Capstick, V., Schepansky, A., Tonkin, K., Vallance, J. K., Ladha, A. B., . . . Courneya, K. S. (2009a). Physical activity preferences of ovarian cancer survivors. *Psycho-Oncology, 18*(4), 422-428. doi: 10.1002/pon.1396

Stevinson, C., Faught, W., Steed, H., Tonkin, K., Ladha, A. B., Vallance, J. K., . . . Courneya, K. S. (2007). Associations between physical activity and quality of life in ovarian cancer survivors. *Gynecologic Oncology, 106*(1), 244-250. doi: 10.1016/j.ygyno.2007.03.033

Stevinson, C.,& Fox, K.R. (2005). Role of exercise for cancer rehabilitation in UK hospitals: a survey of oncology nurses. *European Journal of Cancer Care, 14*(1), 63-69.

Stevinson, C., Tonkin, K., Capstick, V., Schepansky, A., Ladha, A., Valance, J., . . . Courneya, K. (2009b). A population-based study of the determinants of physical activity in ovarian cancer survivors. *Journal of Physical Activity Health, 6*(3), 339-346.

Sun, C. C., Ramirez, P. T., & Bodurka, D. C. (2007). Quality of life for patients with epithelial ovarian cancer. *Nature Clinical Practice Oncology, 4*(1), 18-29

Suzuki, N., Satoko, N., Maruta, S., Hosonuma, S., Nishigaya, Y., Kobayashi, Y., …Ishizuka, B. (2011). Psychological characteristics of Japanese gynecologic cancer patients after learning the diagnosis according to the hospital anxiety and depression scale. *Obstetrics and Gynecology Research, 37*(7), 800-808. doi:10.1111/j.1447-0756.2010.01437.x

Taylor, C. L. C., Demoor, C., Smith, M. A., Dunn, A. L., Basen-Engquist, K., Nielsen, I., . . . & Gritz, E. R. (2006). Active for life after cancer: A randomized trial examining a lifestyle physical activity program for prostate cancer patients. *Psycho-Oncology, 15*(10), 847-862.

Terry, D. J., & O'Leary, J. E. (1995). The theory of planned behaviour: The effects of perceived behavioural control and self-efficacy. *British Journal of Social Psychology, 34,* 199-220.

Trafimow, D., Sheeran, P., Conner, M., & Finlay, K.A. (2002). Evidence that perceived behavioural control is a multidimensional construct: Perceived control and perceived difficulty. *British Journal of Social Psychology, 41*, 101-121.

Trinh, L., Plotnikoff, R.C., Rhodes, R.E., North, S., & Courneya, K.S. (2011a). Associations between physical activity and quality of life in a population-based sample of kidney cancer survivors. *Cancer Epidemiology, Biomarkers, & Prevention, 20*(5), 859-868. doi: 10.1158/1055-9965.EPI-10-1319

Trinh, L., Plotnikoff, R.C., Rhodes, R.E., North, S., & Courneya, K.S. (2011b). Physical activity preferences in a population-based sample of kidney cancer survivors. *Support Care in Cancer, 20*(8), 1709-1717. doi: 10.1007/s00520-011-1264-z

Troiano, R.P, Berrigan, D., Dodd, K.W., Masse, L.C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine & Science in Sports & Exercise, 40*(1), 181-188.

Trost, S. G., McIver, K. L., & Pate, R. R. (2005). Conducting accelerometer-based activity assessments in field-based research. *Medicine & Science in Sports & Exercise.*37, S531–S543.

Trost, S.G., Owen, N., Bauman, A.E., Sallis, J.F., & Brown, W. (2002) Correlates of adults' participation in physical activity: Review and update. *Medicine & Science in Sport & Exercise*, *34,* 1996-2001.

Valenti, M., Porzio, G., Aielli, F., Verna, L., Cannita, K., Manno, R., . . . Ficorella, C. (2008). Physical exercise and quality of life in breast cancer survivors. *International Journal of Medical Science, 5*(1), 24-28.

Vallance, J. K. H., Courneya, K. S., Jones, L. W., & Reiman, T. (2005). Differences in quality of life between non-hodgkin's lymphoma survivors meeting and not meeting public health exercise guidelines. *Psycho-Oncology, 14*(11), 979-991. doi: 10.1002/pon.910

Vallance, J. K. H., Courneya, K. S., Jones, L. W., & Reiman, T. (2006). Exercise preferences among a population-based sample of non-Hodgkin's lymphoma survivors. *European Journal of Cancer Care, 15*(1), 34-43. doi: 10.1111/j.1365-2354.2005.00617.x

Vallance, K.H., Courneya, K.S., Plotnikoff, R.C., Yasui, Y., & Mackey, J.R. (2007). Randomized controlled trial of the effects of print materials and step pedometers on physical activity and quality of life in breast cancer survivors. *Journal of Clinical Oncology, 25*(7), 2532-2539.

Vallance, J.K., Lavalle, C.M., Culos-Reed, N.S., & Trudeau, M.G. (2011). Physical activity is associated with clinically important differences in health-related quality of life among rural and small-town breast cancer survivors. *Support Care in Cancer*, 20(5), 1079-7087. doi: 10.1007/s00520-011-1177-7

Van de Poll-Franse, L.V., Mols, F., Essink-Bot, M-L., Haartsen, J.E., Vingerhoets, J.J.M., Lybeert, M.L.M., . . . Coebergh, W.W. (2007). Impact of external beam adjuvant radiotherapy on health-related quality of life for long-term survivors of endometrial adenocarcinoma: a population based study. *International Journal of Radiation Oncology, Biology and Physics, 69*(1), 125-132. doi:10.1016/j.ijrobp.2007.02.040

van Ryn, M., & Heaney, C.A. (1992). What's the use of theory? *Health Education & Behaviour,*
19, 315-330.

Vansteenkiste, M., Simons, J., Soenes, B., & Lens, W. (2004). How to become a persevering exerciser? Promoting a clear, future intrinsic goal in an autonomy supportive way. *Journal of Sport and Exercise Psychology, 2*(2), 232–249.

Vaz, A.F., Conde, D.M, Costa-Paiva, L., Morais, S.S., Esyeves, S.B., Pinto-Neto, A.M. (2011a). Quality of life and adverse events after radiotherapy in gynecologic cancer survivors: a cohort study. *Archives of Gynecologic Oncology, 284*(6), 1523-1530. doi: 10.1007/s00404-011-1886-x

Vaz, A.F., Pinto-Neto, A.M., Conde, D.M., Costa-Paiva, L., Morais, S.S., & Esteves, S.B. (2008). Quality of life and acute toxicity of radiotherapy in women with gynecologic cancer: a prospective longitudinal study. *Archives of Gynecology and Obstetrics, 278*(3), 215-223. doi: 10.1007/s00404-007-0549-4

Vaz, A.F., Pinto-Neto, A.M., Conde, D.M., Costa-Paiva, L., Morais, S.S., & Esteves, S.B. 2007). Quality of life of women with gynecologic cancer: associated factors. *Archives of Gynecology and Obstetrics, 276,* 583-589. doi: 10.1007/s00404-007-0397-2

Vaz, A.F, Pinto-Neto, AM., Conde, D.M., Costa-Paiva, L., Morais, S.S., Pedro, A.O., & Esteves, S.B. (2011b). Quality of life and menopausal and sexual symptoms in gynecologic cancer survivors: a cohort study. *Menopause: The Journal of the North America Menopause Society, 18*(6). doi: 10.1097/gme.0b013e3181ffde7f

Vistad, I., Fossa, S.D., & Dahl, A.A. (2006). A critical review of patient-rated quality of life studies of long-term survivors of cervical cancer. *Gynecologic Oncology, 102*(3), 563-572. doi:10.1016/j.ygyno.2006.03.050

Von Gruenigen, V.E., Frasure, H.E., Kavanagh, M.B., Lerner, E., Waggoner, S.E., & Courneya, K.S. (2011a). Feasibility of a lifestyle intervention for ovarian cancer patients receiving adjuvant chemotherapy. *Gynecologic Oncology, 122*(2), 328-333.

Von Gruenigen, V.E., Huang, H.Q., Gil, K.M., Frasure, H.E., Armstrong, D.K., & Wenzel, L.B. (2011b). The association between quality of life domains and overall survival in ovarian cancer patients during adjuvant chemotherapy: A Gynecologic Oncology Group Study. *Gynecologic Oncology, 124*(3), 379-382. doi: 10.1016/j.ygyno.2011.11.032

Von Gruenigen, V.E., Huang, H.Q., Gil, K.M. Gibbons, H.E., Monk, B.J., Rose, P.G., …, Wenzel, L. (2010). A comparison of quality-of-life domains and clinical factors in ovarian cancer patients. A gynaecologic oncology group study. *Journal of Pain and Symptom Management, 39*(5), 839-846.

Voskuil, D.W., Monnikhof, E.M., Elias, S.G., Vlems, F.A., van Leeuwen, F.E., & the Task Force Physical Activity and Cancer. (2007). Physical activity and endometrial cancer risk, a systematic review of the current evidence. *Cancer Epidemiology, Biomarkers, & Prevention, 16,* 639-648. doi:10.1158/1055-9965.EPI-06-0742

Ward, D.S., Evenson, K.R., Vaughn, A., Rodgers, A.B., & Troiano, R. (2005). Accelerometer use in physical activity: Best practices and research recommendations. *Medicine & Science in Sports & Exercises, 37*(11), S582-S588.

Ware, J.E., Kosinski, M., & Keller, S.D. (1996). A 12-item short-form health survey: construction of scales and preliminary results of reliability and validity. *Medical Care, 34*, 220-233.

Ware, J.E., Snow, K.K., Kosinski, M., & Gandek B. (1993). SF-36 Health Survey Manual and Interpretation Guide. Boston: The Health Institute, New England Medical Centre

Welk, G., Schabem J., & Morrow, J. (2004). Reliability of accelerometry-based activity monitors: a generalizability study. *Medicine and Science in Sports and Exercise, 36*, 1637-1645.

Wilson, P., Blanchard, C., Nehl, E., & Baker, F. (2006). Predicting physical activity and outcome expectations in cancer survivors: An application of self-determination theory. *Psycho-Oncology, 15*(7), 567-578.

Wilson, P. M., Rodgers, W. Y. M., Blanchard, C. M., & Gessell, J. (2003). The relationship between psychological needs, Self-Determined motivation, exercise attitudes, and physical Fitness1. *Journal of Applied Social Psychology, 33*(11), 2373-2392.

Winzer, B.M., Whiteman, D.C., Reeves, M.M., & Paratz, J.D. (2011). Physical activity and cancer prevention: a systematic review of clinical trials. Cancer Causes and Control, *22*, 811-826. doi: 10.1007/s10522-011-9761-4

Wolin, K.Y., Yan, Y., Colditz, G.A., & Lee, I-M. (2009). Physical activity and colon cancer prevention: a meta-analysis. *British Journal of Cancer, 100*, 611-616. doi:10.1038/sj.bjc.6604917

Wolin, Y., & Tuchman, H. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and gastrointestinal cancer prevention* (pp. 73-100). doi: 10.1007/978-3-642-04231-7

World Health Organization. (2013). *Physical activity.* Retrieved from http://www.who.int/topics/physical_activity/en/

Yang, C.C., & Hsu, Y.L. (2010). A review of accelerometry-based wearable motion detectors for physical activity monitoring. *Sensory, 10*, 7772-7778. doi: 10.3399/s100807772

Yi Pan, S., & Morrison, H. (2011). Physical Activity and Cancer. In K.S. Courneya & C.M. Friedenreich (Series Eds.), *Physical activity and hematologic cancer prevention* (pp. 135-158). doi: 10.1007/978-3-642-04231-7

Zou, G.Y. (2011). Confidence interval estimation for the Bland-Altman limits of agreement with multiple observations per individual. *Statistical Methods in Medical Research*

Appendix A: Tables

Table 1

Descriptive statistics for demographic variables of Phase I sample

Demographic Variable	N	Mean ±SD or %
Age	238	58.54 ± 9.97
Ethnicity	233	
Aboriginal	3	1.3
Black	1	0.4
Caucasian	217	93.1
Other (i.e., Chinese, Filipino)	12	5.2
Marital status	238	
Married/common law	162	68.1
Divorced/separated	34	14.3
Widowed	19	8.0
Never married	23	9.7
Education	237	
Some high school	30	12.7
Completed high school	42	17.7
Some university/college	67	11.4
Completed university/college	27	28.3
Some graduate school	6	5.1
Completed graduate school	22	9.3
Some technical school	12	2.5
Completed technical school	31	13.1
Current household income	231	
>$20,000	24	10.4
$20,000-$39,000	50	21.6
$40,000-69,999	66	28.6
<$70,000	53	22.9
Do not wish to say	38	16.5
Employment status	237	
Employed full-time	72	30.4
Employed part-time	24	10.1
Unemployed	8	3.4
Disability	21	8.9
Homemaker	14	5.9
Student	3	1.3
Retired	89	37.6
Unpaid work	2	0.8
Temporarily unemployed	4	1.7

Table 2

Descriptive statistics for medical variables of Phase I sample

Medical Variable	N	Mean ±SD or %
Months since diagnosis		76.30 (32.47)
Cancer diagnosis	212	
Uterine	92	43.4
Ovarian	57	26.9
Cervical	57	26.9
Vaginal	4	1.9
Don't know	2	0.9
Stage	222	
I	81	36.5
II	25	11.3
III	32	14.4
IV	12	5.4
Don't know	72	32.4
Treatment received	226	
Surgery	112	49.6
Radiation	6	2.7
Chemotherapy	10	4.4
Chemotherapy + Radiation	20	8.8
Chemotherapy + Surgery	40	17.7
Surgery + Radiation	23	10.2
Current treatment status	208	
Completed	195	93.8
Receiving treatment	13	6.3
Recurrence	228	
Yes	20	8.8
No	208	91.2

Table 3

Phase I: Descriptive statistics for physical activity and quality of life in gynaecologic cancer survivors

Variable	M ± SD
Average weekly physical activity in past week (LSI)	
Mild	90.41 ± 183.11
Moderate	70.03 ± 104.48
Vigorous	26.38 ± 64.42
Physical activity minutes[1]	120.67 ± 172.55
Average weekly physical activity in past week (IPAQ)	
Walking	280.43 ± 372.23
Moderate	120.01 ± 228.66
Vigorous	40.34 ± 101.78
Physical activity minutes[1]	191.86 ± 302.84
Average QOL scores (FACT)	
Physical well-being	24.03 ± 4.62
Social well-being	23.03 ± 5.01
Emotional well-being	20.04 ± 3.81
Functional well-being	22.53 ± 5.73
FACT-G	89.56 ± 15.61
Average QOL scores (SF12)	
Physical component summary score	46.56 ± 11.18
Mental component summary score	51.04 ± 10.21

Note. LSI= Leisure Score Index. IPAQ = International Physical Activity Questionnaire. QOL = quality of life. FACT= Functional Assessment of Cancer Therapy. SF12: Short Form Health Survey. [1]PA minutes are calculated as moderate minutes plus two times vigorous minutes

Table 4

Phase I: Pearson correlations among moderate-to-vigorous physical activity and quality of life

	Physical wellbeing	Social wellbeing	Emotional wellbeing	Functional wellbeing	FACT-G	PCS	MCS
LSI MVPA	.185**	.121	.053	.181**	.177*	.364**	.002
IPAQ MVPA	-.003	-.058	-.019	0.046	.035	.135*	-.027

Note. FACT-G = overall quality of life. PCS = physical component score. MCS = mental component score. LSI = Leisure Score Index. IPAQ = International Physical Activity Questionnaire. MVPA = moderate-to-vigorous physical activity.
* $p < 0.05$
** $p < 0.01$

Table 5

Phase I: Differences in quality of life across public health physical activity categories using LSI

Quality of Life Variable	Completely Sedentary	Insufficiently Active	Meeting Guidelines	Above Guidelines	Significance (*p*)
Physical well-being[a]	22.91 (5.17)	24.18 (4.20)	25.11 (3.91)	25.53 (3.79)	= 0.007
Physical well-being[b]	22.57 (.468)	24.57 (.769)	24.96 (.788)	25.39 (.797)	= 0.004
Social well-being	23.33 (5.14)	21.38 (4.49)	23.09 (5.23)	24.24 (4.00)	= 0.066
Emotional well-being	19.73 (3.94)	20.66 (2.91)	20.70 (3.56)	20.43 (3.41)	= 0.361
Functional well-being[a]	21.90 (6.27)	21.96 (5.58)	22.92 (5.09)	24.80 (4.28)	= 0.017
Functional well-being[b]	21.70 (.575)	22.65 (.953)	22.82 (1.002)	24.52 (.982)	= 0.108
FACT-G[a]	87.26 (16.70)	88.63(14.37)	91.81 (15.13)	95.00 (13.17)	= 0.041
FACT-G[b]	86.90 (1.612)	89.93(2.581)	91.19 (2.723)	93.12 (2.696)	= 0.210
PCS[a]	46.61 (11.77)	46.23 (9.68)	50.14 (10.37)	54.31 (6.29)	= <0.001
PCS[b]	41.87 (1.039)	47.27 (1.715)	49.96 (1.796)	53.49 (1.801)	= <0.001
MCS	51.10 (10.87)	49.88 (10.55)	51.99 (7.64)	51.45 (9.74)	= 0.818

Note. FACT-G = overall quality of life. PCS = physical component score. MCS = mental component score. [a] Unadjusted mean (standard deviation). [b]Adjusted mean (standard error) for significant covariates.

Table 6

Phase I: Differences in quality of life across public health physical activity categories using the IPAQ

Quality of Life Variable	Completely Sedentary	Insufficiently Active	Meeting Guidelines	Above Guidelines	Significance (p)
Physical well-being[a]	23.55 (4.89)	23.38 (4.97)	25.65 (3.41)	24.30 (4.42)	= 0.044
Physical well-being[b]	23.15 (.491)	23.59 (.784)	25.37 (.865)	24.49 (.622)	= 0.105
Social well-being[a]	23.16 (4.98)	22.27 (4.49)	24.89 (3.44)	22.36 (5.96)	= 0.024
Social well-being[b]	23.17 (.476)	22.38 (.801)	24.43 (.842)	22.99 (.695)	= 0.353
Emotional well-being[a]	19.93 (3.85)	19.89 (3.40)	20.93 (3.14)	20.22 (3.59)	= 0.582
Functional well-being[a]	22.00 (6.07)	21.64 (6.17)	24.45 (4.46)	23.10 (5.09)	= 0.067
FACT-G[a]	88.34(15.94)	86.40 (16.68)	95.74 (12.34)	90.75 (15.05)	= 0.032
FACT-G[b]	88.29(1.640)	87.19(2.607)	93.20 (2.939)	91.20 (2.201)	= 0.317
PCS[a]	44.14 (11.98)	45.44 (10.51)	50.35 (9.22)	49.75 (10.03)	= 0.003
PCS[b]	43.05 (1.134)	46.60 (1.826)	49.57 (2.032)	49.82 (1.553)	= 0.002
MCS	51.16 (10.54)	50.21 (11.45)	53.12 (7.54)	50.62 (9.66)	= 0.646

Note. FACT-G = overall quality of life. PCS = physical component score. MCS = mental component score. [a] Unadjusted mean (standard deviation). [b]Adjusted mean (standard error) for significant covariates.

Table 7

Descriptive statistics for exercise programming preferences of Phase I study participants

Preference Variable	N	%
Interested in participating in an exercise/physical activity program:	235	
Yes	88	37.4
No	78	33.2
Maybe	69	29.4
Capable of participating in an exercise/physical activity program:	232	
Yes	107	46.1
No	45	19.4
Maybe	80	34.5
Preferred types of exercise (who responded yes):		
Walking	206	95.4
Swimming	86	58.9
Yoga	72	56.7
Cycling	42	38.2
Aerobics	49	44.1
Other	77	64.7
Preferred time of commencing program (who responded yes):		
Before treatment	44	47.8
During treatment	23	28.4
3-6 months after treatment	82	68.3
1 year after treatment	37	42.5
Preferred company during physical activity program (who responded yes):		
Alone	132	79.0
Friends	118	75.6
Family	100	71.4
Other cancer survivors-any cancer	66	48.2
Other cancer survivors-same cancer	55	42.3
No preference	61	61.0
Preferred location of physical activity program (who responded yes):		
Home	141	81.0
Community fitness centre	101	68.7
Cancer fitness centre	47	42.7
No preference	63	61.8
Preferred time of day of physical activity program (who responded yes):		
Morning	122	79.2
Afternoon	72	61.0
Evening	73	59.3
No preference	31	45.6

Preference Variable	N	%
Preferred intensity of physical activity program (who responded yes):		
Low	75	62.0
Moderate	142	84.0
High	25	33.8
No preference	16	32.0
Preferred pattern of activities of physical activity program (who responded yes):		
Same at each session	69	53.9
Different activities at each session	123	75.0
Preferred supervision of physical activity program (who responded yes):		
Supervised	117	72.2
Unsupervised	98	70.0
Preferred structure of physical activity program (who responded yes):		
Spontaneous/flexible	70	54.3
Scheduled	143	87.2

Table 8

Phase I: Summary of associations between demographic variables and PA preferences in gynaecologic cancer survivors

Demographic Characteristic	PA Preferences with significant associations
Gynaecologic cancer survivors 60 years and older compared with survivors 60 years of age and younger were	Less interested in a PA program (59.8% vs. 74.3%; $\chi^2(1) = 5.56$, $p = 0.018$) Less likely to want PA counselling (61.7% vs. 79.3%; $\chi^2(1) = 8.54$, $p = 0.003$) Less likely to prefer PA alone (80.0 % vs. 93.1 %%; $\chi^2(1) = 6.26$, $p = 0.012$) Less likely to prefer PA with cancer survivors (same cancer) (66.7 % vs. 82.9 %; $\chi^2(1) = 4.56$, $p = 0.033$) More likely to prefer morning PA (94.1 % vs. 79.7 %; $\chi^2(1) = 7.31$, $p = 0.007$) Less likely to prefer evening PA (50.0 % vs. 82.3 %; $\chi^2(1) = 14.22$, $p < 0.001$) Less likely to have no time preference (50.0 % vs. 81.6 %; $\chi^2(1) = 7.64$, $p = 0.006$) Less likely to prefer high intensity PA (26.9 % vs. 54.2 %; $\chi^2(1) = 5.07$, $p = 0.024$)
Gynaecologic cancer survivors working compared with survivors not working were	More likely to want PA counselling (78.3 % vs. 65.7 %; $\chi^2(1) = 4.2$, $p = 0.040$) Less likely to prefer morning PA (79.7 % vs. 92.5 %; $\chi^2(1) = 5.42$, $p = 0.20$) Less likely to prefer afternoon PA (70.2 % vs. 85.9 %; $\chi^2(1) = 4.30$, $p = 0.038$) More likely to prefer evening PA (86.8 % vs. 50.0 %; $\chi^2(1) = 19.56$, $p < 0.001$) Less likely to prefer low intensity PA (63.5 % vs. 80.6 %; $\chi^2(1) = 4.37$, $p = 0.037$)
Gynaecologic cancer survivors earning $40, 000 or more compared to survivors earning less than $40,000 were	More likely to want PA counselling (75.9% vs. 59.7%; $\chi^2(2) = 7.42$, $p = 0.024$)
Gynaecologic cancer survivors married/common law compared to survivors single/divorced/widowed were	More likely to prefer doing PA at a community centre (90.3% vs. 72.1%; $\chi^2(1) = 7.85$, $p = 0.005$)

Demographic Characteristic	PA Preferences with significant associations
Survivors meeting PA guidelines compared to those who are not meeting the PA guidelines (LSI)	More likely to prefer PA with cancer survivors (same cancer) (84.7 % vs. 70.3 %; $\chi^2(1) = 3.85$, $p = 0.05$) More likely to prefer yoga (88.0 % vs. 67.1 %; $\chi^2(1) = 7.01$, $p = 0.008$) More likely to prefer cycling (76.1 % vs. 56.5 %; $\chi^2(1) = 13.09$, $p < 0.001$) More likely to have no activity preference (98.0% vs. 81.3 %; $\chi^2(1) = 7.98$, $p = 0.005$) Less likely to prefer to start PA 1 year post-treatment (43.8% vs. 77.8 %; $\chi^2(1) = 10.24$, $p = 0.001$) Less likely to prefer low intensity PA (47.1 % vs. 86.7 %; $\chi^2(1) = 25.96$, $p < 0.001$) More likely to prefer high intensity PA (61.1 % vs. 27.0 %; $\chi^2(1) = 8.61$, $p = 0.003$)
Survivors meeting PA guidelines compared to those who are not meeting the PA guidelines (IPAQ)	More likely to prefer yoga (88.1 % vs. 70.7 %; $\chi^2(1) = 4.61$, $p = 0.032$) More likely to prefer aerobics (89.5% vs. 61.3 %; $\chi^2(1) = 9.28$, $p = 0.002$) Less likely to prefer low intensity PA (47.1 % vs. 28.2 %; $\chi^2(1) = 7.72$, $p = 0.005$)
Gynaecologic cancer survivors who had completed treatment compared to those who haven't were	More likely to prefer doing PA alone (88.1 % vs. 62.5 %; $\chi^2(1) = 4.31$, $p = 0.038$) More likely to prefer doing PA with women only (72.8 % vs. 14.3 %; $\chi^2(1) = 10.52$, $p = 0.003$) More likely to prefer doing PA at a community centre (87.0 % vs. 50.0 %; $\chi^2(1) = 8.34$, $p = 0.004$)
Gynaecologic cancer survivors within 60 months of diagnosis compared with survivors beyond 60 months were	More likely prefer doing PA at a cancer centre (59.0 % vs. 51.0 %; $\chi^2(1) = 6.13$, $p = 0.013$) More likely to have no preference for PA location (86.2 % vs. 66.1 %; $\chi^2(1) = 4.00$, $p = 0.046$) More likely to prefer morning PA (94.7 % vs. 83.3 %; $\chi^2(1) = 4.01$, $p = 0.0403$) More likely to prefer to start PA during treatment (71.0 % vs. 41.9 %; $\chi^2(1) = 6.15$, $p = 0.013$) More likely to prefer high intensity PA (63.6 % vs. 37.2 %; $\chi^2(1) = 4.09$, $p = 0.043$) More like to have no intensity preference (83.3 % vs. 35.5 %; $\chi^2(1) = 7.93$, $p = 0.005$)

Table 9

Comparison of the demographic variables of cancer survivors who were not interested in Phase II compared to those who were interested

	Not Interested (N=145)		Interested (N=94)		
Demographic Variable	N	Mean ± SD or %	N	Mean ± SD or %	Chi-square, p-value
Age	144	59.97 ± 9.18	94	56.35 ± 10.77	
< 65 years	95	66.0	94	72.0	
Marital status	144		95		$\chi^2(3) = 2.97, p = 0.397$
Married/common law	100	69.4	62	66.0	
Divorced/separated	18	12.5	16	17	
Single/Never married	12	8.3	11	11.7	
Widowed	14	9.7	5	5.3	
Education	143		94		$\chi^2(7) = 14.41, p = 0.044$
Completed some high school	25	17.5	5	5.3	
Completed high school	24	16.8	18	19.1	
Completed some university/college	14	9.8	13	13.8	
Completed university/college	40	28.0	27	28.7	
Some graduate school	7	4.9	5	5.3	
Completed graduate school	9	6.3	13	13.8	
Completed some technical school	2	1.4	4	4.3	
Completed technical school	22	15.4	9	9.6	
Current household income	140		91		$\chi^2(4) = 7.170, p = 0.127$
>$20,000	18	12.9	6	6.6	
$20,000-39,999	30	21.4	20	22.0	
$40,000-69,999	36	25.7	30	33.0	
<$70,000	28	20.0	25	27.5	
Do not wish to say	28	20.0	10	11.0	
Employment status	144		93		$\chi^2(8) = 10.72, p = 0.218$
Employed full-time	37	25.5	35	37.6	
Employed part-time	14	9.7	10	10.8	
Unemployed	4	2.8	4	4.3	
Disability	16	11.1	5	5.4	
Homemaker	9	6.3	5	5.4	
Student	1	0.7	2	2.2	
Retired	61	42.4	28	30.1	
Unpaid work	1	0.7	1	1.1	
Temporarily unemployed	1	0.7	3	3.2	

Table 10

Comparison of the medical variables of cancer survivors who were not interested in Phase II compared to those who were interested

	Not Interested (N=145)		Interested (N=94)		
Medical Variable	N	Mean ± SD or %	N	Mean ± SD or %	Chi-square, p-value
Cancer diagnosis	126		86		$\chi^2(4) = 2.47$, $p = 0.650$
Uterine	59	46.8	33	38.4	
Ovarian	33	26.2	24	27.9	
Cervical	30	23.8	27	31.4	
Vaginal	3	2.4	1	1.2	
Don't Know	1	0.8	1	1.2	
Stage	134		88		$\chi^2(4) = 4.14$, $p = 0.388$
I	43	32.1	38	43.2	
II	16	11.9	9	10.2	
III	18	13.4	14	15.9	
IV	8	6.0	4	4.5	
Don't know	49	36.6	23	26.1	
Treatment received	135		91		$\chi^2(6) = 5.49$, $p = 0.483$
Surgery	61	45.2	51	56.0	
Chemotherapy	5	3.7	5	5.5	
Chemotherapy + Surgery	26	19.3	14	15.4	
Chemotherapy + Radiation	15	11.1	5	5.5	
Surgery + Radiation	14	10.4	9	9.9	
All	9	6.7	6	6.6	
Current treatment status	127		81		$\chi^2(1) = 1.47$, $p = 0.226$
Completed	117	92.1	78	96.3	
Receiving treatment	10	7.9	3	3.7	
Recurrence	135		93		$\chi^2(1) = 3.04$, $p = 0.581$
Yes	13	9.6	7	7.5	
No	122	90.4	86	92.5	

Table 11

Comparison of the demographic variables of cancer survivors who participated in Phase II compared to those who did not

	Participated (N=20)		Did not participate (N=74)		
Demographic Variable	N	Mean ± SD or %	N	Mean ± SD or %	Chi-square, p-value
Age	20	53.85 ± 9.79	74	57.03 ± 10.98	
<65 years	20	100.0	52	70.3	
Marital status	20		74		$\chi^2(3) = 3.147$, $p = 0.370$
Married/common law	16	80.0	46	62.2	
Divorced/separated	3	15.0	13	17.6	
Single/Never married	1	5.0	10	13.5	
Widowed			5	6.8	
Education	20		74		$\chi^2(7) = 11.59$, $p = 0.115$
Some high school	-	-	5	6.8	
Completed high school	7	35.0	11	14.9	
Some university/college	-	-	13	17.6	
Completed university/college	6	30.0	21	28.4	
Some graduate school	2	20.0	3	4.1	
Completed graduate school	4	10.0	9	12.2	
Some technical school	-	-	4	5.4	
Completed technical school	1	5.0	8	10.8	
Current household income	20		71		$\chi^2(4) = 9.12$, $p = 0.058$
>$20,000	1	5.0	5	7.0	
$20,000-39,999			20	28.2	
$40,000-69,999	7	35.0	23	32.4	
<$70,000	8	40.0	17	23.9	
Do not wish to say	4	20.0	6	8.5	
Employment status	20		73		$\chi^2(8) = 14.93$, $p = 0.061$
Employed full-time	6	30.0	29	39.7	
Employed part-time	6	30.0	4	5.5	
Unemployed	-	-	4	5.5	
Disability	-	-	5	6.8	
Homemaker	2	10.0	3	4.1	
Student	1	5.0	1	1.4	
Retired	5	25.0	23	31.5	

Unpaid work	-	-	1	1.4
Temporarily unemployed	-	-	3	4.1

Table 12

Comparison of the demographic variables of cancer survivors who participated in Phase II compared to those who did not

	Participated (N=20)		Did not Participate (N=74)		
Medical Variable	N	Mean ± SD or %	N	Mean ± SD or %	Chi-square, p-value
Months since diagnosis		75.85 ± 33.30			
Cancer diagnosis	17		69		$\chi^2(4) = 0.67$, $p = 0.956$
Uterine	6	35.3	27	39.1	
Ovarian	5	29.4	19	27.5	
Cervical	6	35.3	21	30.4	
Vaginal	-	-	1	1.4	
Don't Know	-	-	1	1.4	
Stage	20		68		$\chi^2(4) = 3.32$, $p = 0.506$
I	7	35.0	31	45.6	
II	3	15.0	6	8.8	
III	4	20.0	10	14.7	
IV	2	10.0	2	2.9	
Don't know	4	20.0	19	27.9	
Treatment received	20		71		$\chi^2(6) = 4.94$, $p = 0.552$
Surgery	8	40.0	43	60.6	
Chemotherapy	1	5.0	4	5.6	
Chemotherapy + Surgery	4	20.0	10	14.1	
Chemotherapy + Radiation	1	5.0	4	5.6	
Surgery + Radiation	4	20.0	5	7.0	
All	2	10.0	4	5.6	
Current treatment status	20		62		$\chi^2(1) = 0.955$, $p = 0.329$
Completed	19	95.0	59	95.2	
Receiving treatment	1	5.0	3	4.8	
Recurrence	20		73		$\chi^2(1) = 2.04$, $p = 0.153$
Yes	3	15.0	4	5.5	
No	17	85.0	69	94.5	

Table 13

Phase II: Descriptive statistics for self-reported physical activity and quality of life in gynaecologic cancer survivors

Variable	M ± SD
Average weekly physical activity in past week (LSI)	
Mild	77.57 ± 78.40
Moderate	100.26 ± 121.42
Vigorous	52.37 ± 127.37
Physical activity minutes[1]	205.00 ± 286.53
Average weekly physical activity in past week (IPAQ)	
Walking	367.89 ± 517.21
Moderate	174.74 ± 307.83
Vigorous	112.11 ± 218.09
Physical activity minutes[1]	398.95 ± 531.69
Average QOL scores (FACT)	
Physical well-being	24.09 ± 4.55
Social well-being	22.94 ± 5.29
Emotional well-being	20.44 ± 3.05
Functional well-being	23.61 ± 4.98
FACT-G	91.09 ± 13.19
Average QOL scores (SF12)	
Physical component score	50.08 ± 9.22
Mental component score	51.49 ± 7.44

Note. LSI= Leisure Score Index. IPAQ = International Physical Activity Questionnaire. QOL = quality of life. FACT= Functional Assessment of Cancer Therapy. SF12= Short Form Health Survey. [1]PA minutes are calculated as moderate minutes plus two times vigorous minutes.

Table 14

Phase II: Descriptive statistics for objective physical activity in gynaecologic cancer survivors

Variable	M ± SD
Average weekly physical activity	
Sedentary	2933.75 ± 1081.68
Light	799.32 ± 335.04
Moderate	233.24 ± 139.52
Vigorous	18.94 ± 34.01
Total Physical activity minutes[1]	252.18 ± 150.12
Total Physical activity minutes[2]	83.12 ± 88.39
Physical activity minutes[3]	169.06 ± 113.59

Note: [1]PA minutes are calculated as moderate minutes plus vigorous minutes; [2]PA minutes are calculated as moderate minutes plus vigorous minutes accumulated in 10 minute activity bouts; and [3]PA minutes are calculated as moderate minutes plus vigorous minutes accumulated in less than 10 minute activity bouts.

Table 15

Phase II: Differences in quality of life across public health physical activity categories using objective PA data in gynaecologic cancer survivors

Quality of Life Variable	Completely Sedentary	Insufficiently Active	Meeting Guidelines	Significance (*p*)
Physical well-being	24.60 (2.79)	22.08 (5.93)	26.5 (1.00)	=0.130
Social well-being	23.87 (2.98)	20.29 (6.68)	26.08 (2.00)	=0.183
Emotional well-being	20.60 (4.10)	20.00 (3.34)	21.50 (1.29)	=0.759
Functional well-being	24.80 (3.77)	21.25 (6.18)	26.25 (2.06)	=0.188
FACT-G	93.87 (8.65)	83.63 (15.43)	100.33 (5.29)	=0.095
PCS	52.68 (7.53)	45.60 (11.37)	54.34 (2.02)	=0.233
MCS	49.16 (6.76)	49.90 (9.15)	56.86 (0.67)	=0.262

Note. FACT-G = overall quality of life. PCS = physical component score. MCS = mental component score.

Table 16

Descriptive statistics for exercise programming preferences of Phase II study participants

Preference Variable	N	%
Interested in participating in an exercise/physical activity program:	19	
Yes	12	63.2
No	3	15.8
Maybe	4	21.1
Capable of participating in an exercise/physical activity program:	19	
Yes	14	73.7
No	2	10.5
Maybe	3	15.8
Preferred types of exercise (who responded yes):		
Walking	17	94.4
Swimming	5	35.7
Yoga	11	73.3
Cycling	4	28.6
Aerobics	9	56.3
Other activities	6	54.5
Preferred time of commencing program (who responded yes):		
Before treatment	5	55.6
During treatment	3	30.0
3-6 months after treatment	6	60.0
1 year after treatment	3	37.5
Preferred company during physical activity program (who responded yes):		
Alone	14	82.4
Friends	13	81.3
Family	11	84.6
Other cancer survivors-any cancer	8	53.3
Other cancer survivors-same cancer	9	60.0
No social preference	5	50.0
Preferred location of physical activity program (who responded yes):		
Home	14	77.8
Community fitness centre	14	82.4
Cancer fitness centre	10	66.7
No location preference	6	60.0
Preferred time of day of physical activity program (who responded yes):		
Morning	12	70.6
Afternoon	7	50.0
Evening	8	50.0
No time preference	1	16.7

Preference Variable	N	%
Preferred intensity of physical activity program (who responded yes):		
Low	5	50.0
Moderate	15	88.2
High	6	60.0
No intensity preference	4	40.0
Preferred pattern of activities of physical activity program (who responded yes):		
Same at each session	6	50.0
Different activities at each session	9	60.0
Preferred supervision of physical activity program (who responded yes):		
Supervised	13	76.5
Unsupervised	6	50.0
Preferred structure of physical activity program (who responded yes):		
Spontaneous	5	45.5
Scheduled	15	88.2

Table 17

Descriptive statistics for exercise programming preferences from interviews of Phase II study participants

Preference Variable	N = 16	%
Who should be providing PA or exercise counselling:		
Doctor	3	18.75
Counsellor	6	37.5
Healthcare team (nurse, physiotherapist, etc)	4	25.0
Someone recommended by doctor	1	6.25
No response	2	12.5
What types of PA information should be provided*:		
Benefits of PA	5	31.25
Available services	4	25.0
Types and/or amount of PA	7	43.75
No response	2	12.5
When should this information be provided:		
Before treatment	1	6.25
Post treatment	5	31.25
Information available anytime	2	12.5
No response	8	50.0
Location of information or PA personnel:		
Clinic	10	62.5
No response	6	37.5
Interested in PA program:		
Yes	9	56.25
Maybe	4	25.0
No	3	18.75
What interests you about a PA program*:		
PA Benefits	8	50.0
Expertise/Tailored program	3	18.75
Support	8	50.0
Provides distraction	2	12.5
Regain control of life	1	6.25
Positive for support network	1	6.25
Factors involved with participation*:		
Cost	5	31.25
Location	7	43.75
Time	7	43.75
Energy	3	18.75
Support (e.g., family, spouse)	2	12.5
Transportation	2	12.5
Side effects	1	6.25

Preference Variable	N = 16	%
Activities of interest:		
Walking*	7	43.75
Social (conversation)	2	12.5
Outdoors	2	12.5
Easy	1	6.25
Modifiable (e.g., own pace)	1	6.25
Accessible	1	6.25
Peaceful	1	6.25
Dancing (e.g., zumba)	7	43.75
Fun	3	18.75
Yoga	4	25.0
Relaxing	3	18.75
Gentle	1	6.25
Gardening	1	6.25
Outdoors	1	6.25
Preferred location of physical activity program:		
Home	6	37.5
Fitness centre	7	43.75
Mix	2	12.5
No response	1	6.25
Preferred time of day of physical activity program*:		
Morning	6	37.5
Afternoon	2	12.5
Evening	4	25.0
Mix	1	6.25
No response	2	12.5
Preferred instruction of physical activity program:		
Supervised	11	68.75
Unsupervised	1	6.25
Mix	2	12.5
No response	2	12.5
Preferred structure of physical activity program:		
Spontaneous/flexible	2	12.5
Scheduled	11	68.75
No response	3	18.75
Preferred time of commencing a program:		
Pre-treatment	1	6.25
Post-treatment	10	62.5
As soon as possible	3	18.75
Unsure	1	6.25
No response	1	6.25

*Some participants had more than one response to a particular question.

Appendix B: Figures

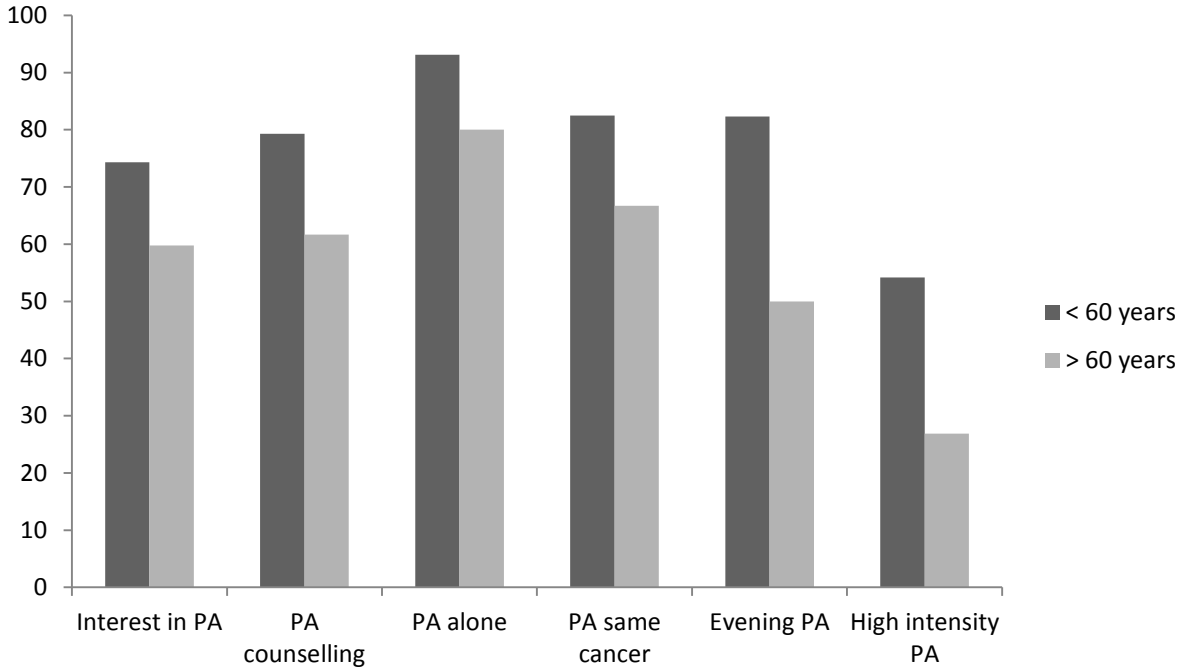

Figure 1. Significant physical activity preference of gynaecologic cancer survivors by age.

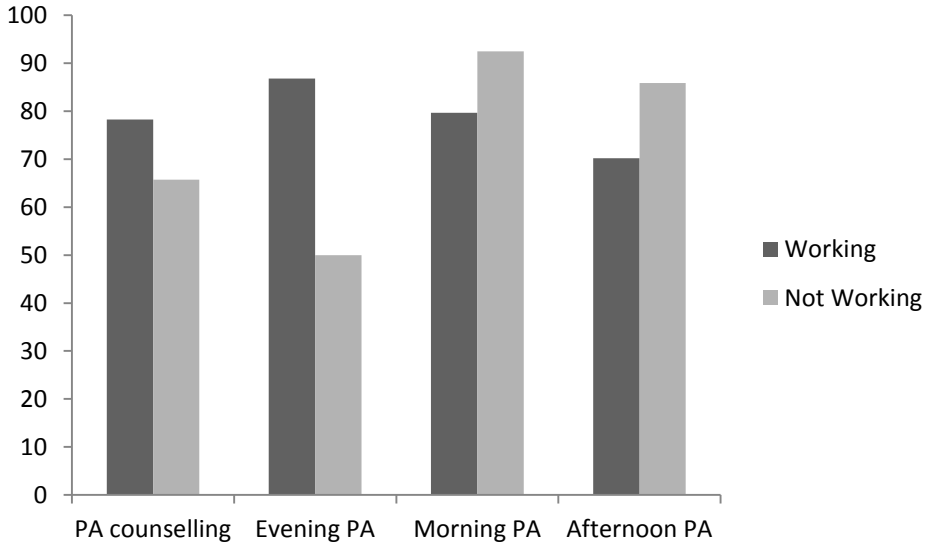

Figure 2. Significant physical activity preference of gynaecologic cancer survivors by employment status.

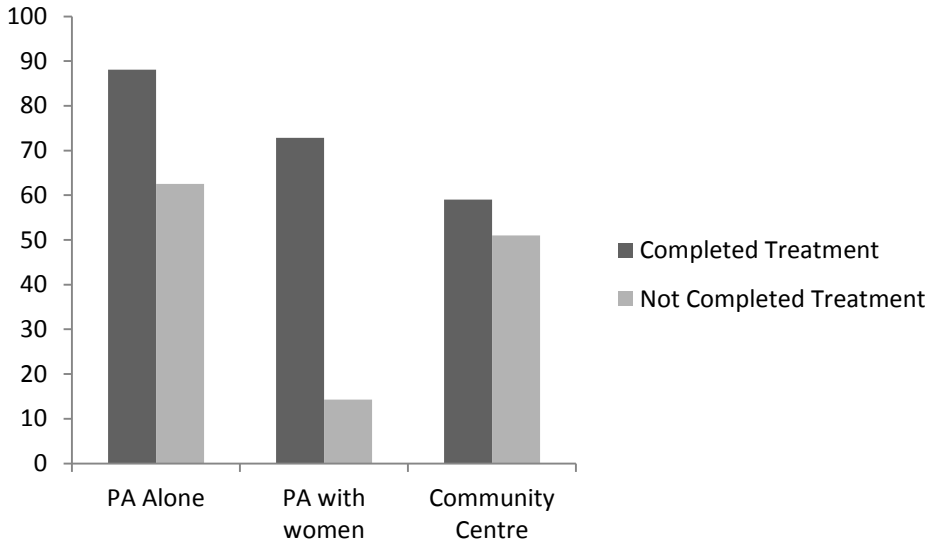

Figure 3. Significant physical activity preference of gynaecologic cancer survivors by treatment status.

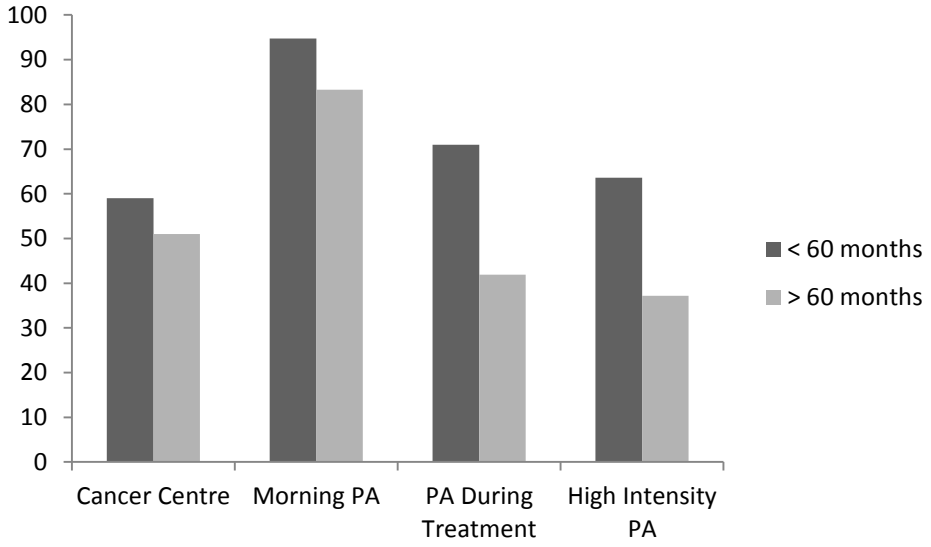

Figure 4. Significant physical activity preference of gynaecologic cancer survivors by months since diagnosis.

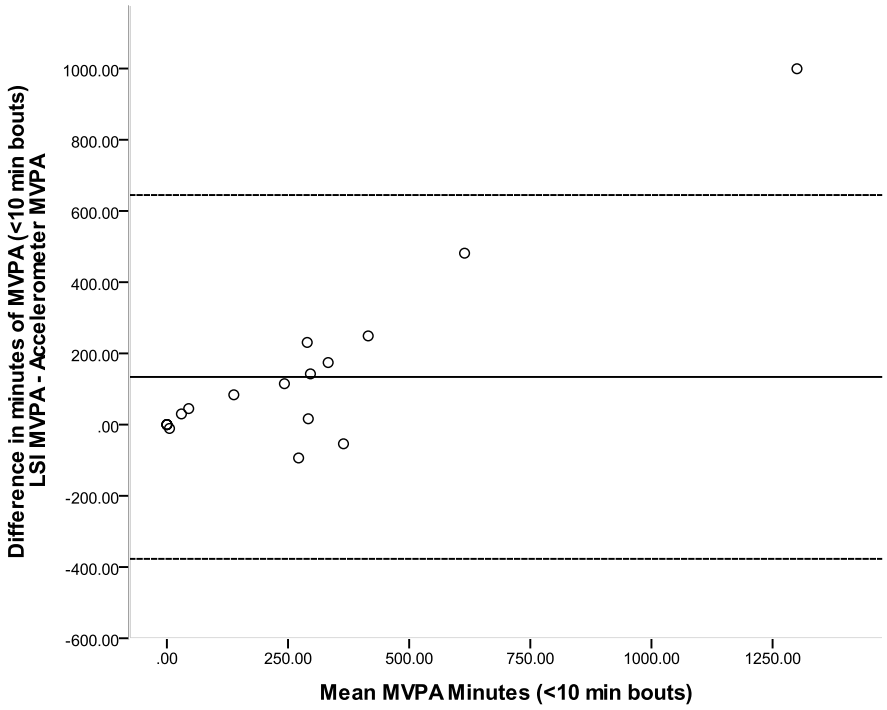

Figure 5. Difference in minutes of moderate-to-vigorous activity between the LSI and accelerometer

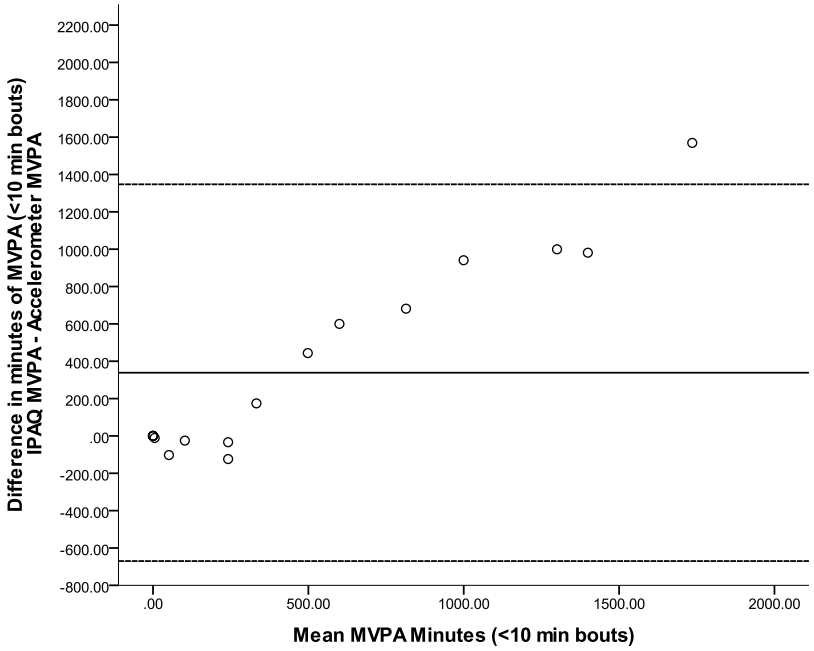

Figure 6. Difference in minutes of moderate-to-vigorous activity between the IPAQ and the accelerometer

Appendix C: Letter of Information & Cover Letter

DATE

Ms. Jane Doe
XXXXXX
123 Smith St
Sydney,NS
B1P 1P1

Study ID:

Dear Ms. Doe:

On behalf of *Cancer Care Nova Scotia* (CCNS), I am writing to invite you to participate in a cancer research study to help understand physical activity behaviours in Nova Scotia women who have had an experience with gynaecologic cancer.

How we got your name
Your name was identified from the Nova Scotia Cancer Registry at *CCNS*. CCNS is a program of the Nova Scotia Department of Health & Wellness. Our job is to set treatment and care standards, monitor services, and support research on cancer. The Registry is a database that contains the names of all people who have been diagnosed with a reportable cancer condition in this province. The information collected by the Registry is used to study and monitor cancer in Nova Scotia.

Your privacy is very important
Cancer Care Nova Scotia is responsible to ensure that all personal information in the Registry is kept private. From time to time, we are contacted by researchers who want to talk with Nova Scotians about their cancer experience. The Registry is not allowed to give your name to any researcher, so we are contacting you on their behalf to ask if you wish to participate in their study.

This study is being conducted by Ashley Tyrrell (Masters of Arts Health Promotion Candidate) from Dalhousie University. It has received ethical approval from the Research

Ethics Board at Capital Health in Halifax. Detailed information about the study and what you will be asked to do is enclosed.

What is required of you?
If you agree to participate in this study please complete the enclosed questionnaire and return it in the pre-paid, addressed envelope. The questionnaire takes approximately 45 minutes to complete. A detailed letter from the researcher with more information about the study is included with the questionnaire. Returned questionnaires will be forwarded to the researcher after any personal identifying information is removed.

Thank you for taking the time to read this letter. If you have any questions or concerns, please contact *CCNS* at our toll free line, 1-800-599-2267 and you will be put through to a staff member. You can also contact staff directly: Rosalee Walker, Research Assistant at (902) 473-3494 or Maureen Macintyre, Registry Director at (902) 473-6084.

Sincerely,

Maureen MacIntyre, MHSA
Director, Surveillance & Epidemiology Unit
Cancer Care Nova Scotia

DALHOUSIE UNIVERSITY
Inspiring Minds

PHYSICAL ACTIVITY AND GYNAECOLOGIC CANCER IN NOVA SCOTIA

Dear Participant,

My name is Ashley Tyrrell and I am a current graduate student in the Masters program, specializing in Health Promotion, at Dalhousie University. I am working under the supervision of Dr. Melanie Keats, an assistant professor at Dalhousie University, to complete my thesis project for which you have been contacted.

I invite you to participate in a two phase research study investigating understand physical activity behaviours in Nova Scotia women who have had an experience with gynaecologic cancer. Phase I is a mail survey about physical activity and quality of life of gynaecologic cancer survivors in Nova Scotia. Phase II is a 9-day study which requires participants to wear a physical activity monitor (accelerometer), and to complete an additional survey about physical activity and quality of life.

Please find enclosed a copy of the consent form for your review which provides information about a) how you were identified; b) the reason why we are doing this study; c) what we are asking you to do; d) potential risks/harms; e) privacy and confidentiality; f) the choice to volunteer to participate; and g) the freedom to choose not to respond to any questions and/or withdraw from the study at any time. If you are unsure about anything contained in the consent, please do not hesitate to contact us so that we can answer any of your questions.

If you wish to participate in Phase I of this study, please complete and return the survey in the addressed envelope provided. If you live in the Halifax Regional Municipality and are interested in participating in Phase II of the study, please provide your contact information in the space provided within the consent form so that I can contact you at a later date.

If you are do not wish to participate in the study and do not wish to receive any further correspondences related to the study, please complete and return the next page.

If at any time you have any questions or concerns about the study, please feel free to contact myself, Ashley Tyrrell (Ashley.Tyrrell@dal.ca) or Dr. Melanie Keats at (902) 494-7173 or by e-mail at Melanie.Keats@Dal.ca.

Sincerely yours,

Ashley Tyrrell
MA Health Promotion Candidate
School of Health and Human Performance
Dalhousie University
6230 South Street
Halifax, Nova Scotia, B3H 1T8

Capital Health

Appendix D: Phase I Consent Form

PHASE I: PARTICIPANT CONSENT FORM

Study Title:	Physical Activity and Gynaecologic Cancer Survivors in Nova Scotia
Principal Investigator:	Ashley Tyrrell, B.P.H.E, B.Sc M.A. Candidate, Health Promotion Dalhousie University Phone: (902) 489-1656 E-mail: Ashley.Tyrrell@dal.ca
Thesis Supervisor:	Dr. Melanie Keats, PhD Assistant Professor, Health and Human Performance Dalhousie University Phone: (902) 494-7173 E-mail: melanie.keats@dal.ca
Associate Investigators:	Please see the attached Research Team Contact Page for a full list of the investigators for this study

PART A.

1. Introduction

You are invited to take part in a research study. Taking part in this study is voluntary. It is up to you to decide whether to be in the study or not. Before you decide, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

Please read this carefully. Take as much time as you like. Mark anything you don't understand, or want explained better. After you have read it, please ask questions about anything that is not clear.

The researchers will:

- Discuss the study with you
- Answer your questions
- Keep confidential any information which could identify you personally
- Be available during the study to deal with problems and answer questions

We do not know if taking part in this study will help you. You may feel better. On the other hand it might not help you at all. It might even make you feel worse. We cannot always predict these things. We will always give you the best possible care no matter what happens.

If you decide not to take part or if you leave the study early, your usual health care will not be affected

PART B.

2. Why Is This Study Being Done?

Physical activity has shown great promise for cancer survivors, providing a range of physical and psychological benefits, and improvements in quality of life. While these positive findings have spurred the development of physical activity interventions for cancer survivors a limited amount of research has explored the physical activity behaviours of gynaecologic cancer survivors. In an effort to contribute to our understanding of physical activity behaviours of cancer survivors, particularly in gynaecologic cancer survivors, Phase I of this study will explore the physical activity behaviours of gynaecologic cancer survivors in Nova Scotia. Phase I will also explore how various activity levels relate to quality of life.

3. Why Am I Being Asked To Join This Study?

Your name was identified by the Nova Scotia Cancer Registry as someone who has received a diagnosis of *gynaecologic cancer (*i.e., ovarian, cervical, uterine, vaginal, vulvar) within the last 10 years (i.e., January 1, 2000). You are eligible to participate in this study if are between 18 and 69 years of age, and if you were diagnosed within the last 10 years (i.e., January 1, 2000). If you do not have a confirmed gynaecologic cancer diagnosis, or if you are/were not 18 years of age or older you are not eligible to participate.

4. How Long Will I Be In The Study?

You will be asked to complete a one-time, pen and paper survey. The survey will take approximately 45 minutes to complete. You may also wish to participate in Phase II upon completion of the initial survey. You do not have to participate in Phase II of the study if you do not want to.

5. How Many People Will Take Part In This Study?

This study is taking place only in Nova Scotia. It is expected that approximately 900 participants will be identified to participate in the survey component of the study (Phase I). Involvement in the Phase II of the study will be voluntary in nature, so will be determined by the availability and interest of eligible participants.

6. How Is The Study Being Done?

Phase I of this study involves the completion of a brief survey sent to you in the mail. The survey will cover topics about your physical activity, general health and well-being/quality of life. An addressed, stamped envelope has been provided to return the survey to us for your convenience.

7. What Will Happen If I Take Part In This Study?

Participation in Phase I of this research study involves the completion and return of the consent forms and surveys provided within the study pack.

8. Are There Risks To The Study?

The risks for this study are minimal. You will be asked to complete a one-time survey about your physical activity levels and your quality of life and well-being. You may find the questionnaires you receive during the course of the study upsetting or distressing. You may not like all of the questions that you will be asked. If you are uncomfortable responding to any of the questions you can leave them blank or you are free to choose to not take part. Should you find during the study that you need additional emotional support the research team would strongly encourage you to return to your physician to receive the needed care.

Although the research staff will make every effort to ensure your safe participation, there may be the possibility of unforeseen harms.

9. What Happens at the End of the Study?

This study is made up of two phases. While many physical activity studies have explored the physical activity behaviours of cancer survivors, a limited number have used objective measures (i.e., pedometer or a step counter) of physical activity or measures of people's 'actual' behaviour. Phase II of this study will compare objectively measured physical activity by accelerometers (a digital physical activity monitors) with self-reported physical activity (i.e., survey). Accelerometers are similar to pedometers (step counter), but are also able to record how hard you are working. Accelerometers will be compared with self-reported physical activity to determine how various activity levels relate to quality of life. If you are interested in learning more about Phase II, and participating please complete and return the last page of this form. The principle investigator will then contact you about Phase II of this study.

At the end of the study the results will be presented at various conferences, within the community and potentially published. The final study results can be available to you once the study is completed and reported. The results will be mailed to you if you want to receive them. You will be asked to check the last page of this form indicating if you wish to receive a summary of the results of the study.

10. What Are My Responsibilities?

As a study participant you will be expected to:

- Follow the directions of the Principal Investigator
- Provide written consent to participate
- Complete and return the study pack to the address indicated using the self-addressed, paid envelope

11. Can I Be Taken Out Of The Study Without My Consent?

Yes. You may be taken out of the study at any time, if:

- There is new information that shows that being in this study is not in your best interests.
- The Capital Health Research Ethics Board or the Principal Investigator decides to stop the study.

You will be told about the reasons why you might need to be taken out of the study.

12. What About New Information?

It is possible (but unlikely) that new information may become available while you are in the study that might affect your health, welfare, or willingness to stay in the study. If this happens, you will be informed in a timely manner, and will be asked whether you wish to continue taking part in the study or not.

13. Will It Cost Me Anything?

Compensation

You will not be paid to be in this study.

Research Related Injury

If you become ill or injured as a direct result of participating in this study, necessary medical treatment will be available at no additional cost to you. Your signature on this form only indicates that you have understood to your satisfaction the information regarding your participation in the study and agree to participate as a subject. In no way does this waive your legal rights nor release the Principal Investigator, the research staff, the study sponsor or involved institutions from their legal and professional responsibilities.

14. What About My Right To Privacy?

Protecting your privacy is an important part of this study. Your name was identified by the Nova Scotia Cancer Registry and *has not* been shared with the Principal Investigator or any member of the research team. While your name will appear on these forms, your name will not be recorded on any study related information. All of the information will be

recorded using a unique coding number that will not identify you by name. Your name will not appear in any report or article as a result of this study.

All questionnaires collected from this study will be kept in a locked cabinet in Dr. Melanie Keats's faculty office in the Dalplex for 7 years after the publication of the results from the study, at which point all physical and electronic data from this study will be destroyed.

Access to and Use of Records

The research team will not access or collect any data from your personal health records.

15. What if I Want to Quit The Study?

If you chose to participate and later change your mind, you can stop the research at any time. You are asked to return the questionnaire to the principle investigator. *A decision to stop being in the study will not affect your medical care or treatment.*

16. Declaration of Financial Interest

The Principal Investigator has no financial interests in conducting this research study.

17. What About Questions Or Problems?

For further information about the study call Ashley Tyrrell. Ashley Tyrrell is in charge of this study at this institution (she is the "Principal Investigator"). Ashley Tyrrell's telephone number is (902) 489-1656. If you can't reach the Principal Investigator, please refer to the attached Research Team Contact Page for a full list of the people you can contact for further information about the study.

The Principal Investigator is Ashley Tyrrell

Telephone: (902) 489-1656 or Ashley.Tyrrell@dal.ca

The student's supervisor is Dr. Melanie Keats

Telephone: (902) 494-7173 or melanie.keats@dal.ca

18. What Are My Rights?

If you have any questions about your rights as a research participant, contact the Patient Representativeat(902) 473-2133.

In the next part you will be asked if you agree (consent) to join this study.

PART C.

19. PHASE I: Informed Consent Information

I have reviewed all of the information in this consent form related to the study called:

Physical Activity and Gynaecologic Cancer Survivors in Nova Scotia

The return of the completion and return of this questionnaire means that I agree to take part in Phase I of this study. I understand that I am free to withdraw at any time.

I will be given a copy of this consent form my personal records.

This form continues on the next page!

Please complete this page and return it, along with your questionnaire, in the stamped, self-addressed envelope that has been provided.

20. PHASE II: 9-day Measurement Study

□ **I am interested** in taking part in PHASE II of this study and I am between 18-65 years of age and a resident of the Halifax Regional Municipality.

AND

□I consent for the primary investigator to contact me at one of the following
Name: _____
Email:_____
Phone: _____

□ **I am not interested** in taking part in PHASE II of this study

21. Results of the Study

□ I would like Ashley Tyrrell to send me a summary of the final results.

Please send results to (e-mail or mail address):

_____

_____

**Note: if you are not comfortable disclosing your contact information, a summary of the results will appear in a Cancer Care Nova Scotia newsletter once the study is completed. You can subscribe to this newsletter at the follow link:*
http://www.cancercare.ns.ca/en/home/aboutus/newsroomandevents/ournewsletter/subscribenewsletters/default.aspx

Thank you for your time and patience!

Capital Health

RESEARCH TEAM CONTACT PAGE

TRIAL/STUDY TITLE	**TRIAL/STUDY SPONSOR**
PHYSICAL ACTIVITY AND GYNAECOLOGIC CANCER IN NOVA SCOTIA: A COMPARISON OF OBJECTIVE AND SELF-REPORT PHYSICAL ACTIVITY AND THEIR ASSOCIATION WITH QUALITY OF LIFE	**N/A**

Name	Role	Work Address	Telephone Number	E-Mail Address
Ms. Ashley Tyrrell	Principal Investigator	School of Health and Human Performance, Dalhousie University 6230 South Street	(902) 489-1656	Ashley.Tyrrell@dal.ca
Dr. Melanie Keats	Supervisor/Co-Principal Investigator	School of Health and Human Performance, Dalhousie University 6230 South Street	(902) 473-7173	Melanie.Keats@dal.ca
Dr. Chris Blanchard	Co-Investigator	QEII Health Sciences Centre Centre for Clinical Research 5790 University Avenue	(902) 473-3789	Chris.blanchard@dal.ca
Dr. Louise Parker	Co-Investigator	Atlantic Path 1494 Carlton Street	(902) 494-3566	louise.parker@iwk.nshealth.ca

Appendix E: Phase I Study Pack

PHYSICAL ACTIVITY AND GYNAECOLOGIC CANCER IN NOVA SCOTIA

Thank you for agreeing to participate in this research study. The first part of the survey is needed to help us understand more about you. For this reason, it is very important information. All of the information is held in strict trust and your name will **NOT** appear on any public documents. Please answer the following questions based on your **present status**. After completing the survey, please place it in the stamped addressed envelope and send it back to us as soon as possible. For further information or if you have any questions about completing the questionnaire, please contact Ashley Tyrrell (Principal Investigator) by e-mail at tyrrellashley@gmail.com or phone at (902)489-1656.

MEDICAL INFORMATION

If you have had more than one cancer diagnosis, based on your **GYNAECOLOGIC DIAGNOSIS**, please answer the following questions:

1. What type of gynaecologic cancer diagnosis did/do you have? (check all that apply):
□ uterine □ ovarian □ cervical □ vulvar □ vaginal □ don't know
□ specify:_____

2. In what month and year were you diagnosed? _____

3. What stage of Gynaecologic cancer were you diagnosed with? (please circle)

   Stage 1 Stage 2 Stage 3 Stage 4 Do not know

4. What type of treatment did you receive? (please check ALL that apply)
   □ Chemotherapy □ Radiation therapy □ Surgery
   □ Other (specify): _____

   4b. Have you completed treatment? ☐ Yes ☐ No (If no, skip to question 5)

   4c. If you have completed treatment, when was your last treatment (month/year)? _____

5. Have you experienced a recurrence of this cancer? (Note. *Cancer recurrence* is defined as the return of cancer after treatment and after a period of time during which the cancer cannot be detected).
   ☐ Yes ☐ No
   *If you answer No, please skip questions (5b, c, d, and e)

   5b. If **Yes**, please specify type of recurrence, month/year of recurrence:
   _____

   5c. What type of treatment did you receive with the recurrence? (please check ALL that apply)
   □ Chemotherapy □ Radiation therapy □Surgery
   □ Other (specify): _____

5d. Have you completed treatment for this recurrence? ☐ Yes ☐ No (If no, skip question 5e)

5e. If you have completed treatment, when was your last treatment (month/year)? _____

6. Is your physical activity limited by conditions related to your cancer (i.e., symptoms, side-effects)? Please explain.

_____

_____

_____

_____

_____

_____

_____

7. Is your physical activity limited by other medical or health conditions (i.e., arthritis, high blood pressure)? Please explain.

_____

_____

_____

_____

_____

_____

_____

LESIURE-TIME PHYSICAL ACTIVITY QUESTIONNAIRE

The following portion of the questionnaire will ask you to recall your *average weekly* level of physical activity *over the past seven days (ONE WEEK)*.

When answering the following questions, please remember to:

- **Consider your average over the past week.**
- **Only count activity/exercise sessions that lasted *10 minutes or longer.***
- **Only include exercise/activity that you do in your *leisure/free time.***
- **Please record the average duration or time that you performed each activity**.

Please record a number in each of the space provided. If you did no activity, then please record a '0'

A: STRENUOUS ACTIVITY (heart beats rapidly, sweating)
(i.e., running, jogging, hockey, football, soccer, squash, cross country, skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous aerobics classes, heavy weight training, laser tag)

During the past week, I was involved in *strenuous activities* _____ times/week for an average duration of _____ minutes each session.

B: MODERATE ACTIVITY (not exhausting, light perspiration)
(i.e., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and line dancing, leisure skating)

During the past week, I was involved in *moderate activities* _____ times/week for an average duration of _____ minutes each session.

C: MILD ACTIVITY (minimal effort, no perspiration)
(i.e., easy walking, yoga, archery, fishing, bowling, horseshoes, golf, darts, Frisbee)

During the past week, I was involved in *mild activities* _____ times/week for an average duration of _____ minutes each session.

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing vigorous physical activities on one of those days?

   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ **days per week**

   ☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing moderate physical activities on one of those days?

_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend walking on one of those days?

_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the last 7 days, how much time did you spend sitting on a week day?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

EXERCISE PREFERENCES

We each have our own reasons for being or not being physically active. In an effort to better develop programs that meet your individual needs, it is important to know whether or not you are interested in physical activity and if so, what types of activities you prefer, where you like to exercise, and how hard you like to exercise. The following questions will help us better understand your needs.

1. Did you receive any exercise/physical activity counselling following your diagnosis?	☐ Yes	☐ No	☐ Unsure
2. Would you have liked to have received some form of exercise/physical activity counselling following your diagnosis?	☐ Yes	☐ No	☐ Maybe
3. Would you be interested in participating in an exercise/physical activity program designed for cancer survivors?	☐ Yes	☐ No	☐ Maybe
4. Would you be able to participate in an exercise/physical activity program designed for cancer survivors?	☐ Yes	☐ No	☐ Maybe
5. Who would you like to exercise with? (check as many as apply)			
a. Alone	☐ Yes	☐ No	☐ Maybe
b. With other cancer survivors (same cancer)	☐ Yes	☐ No	☐ Maybe
c. With other cancer survivors (any cancer)	☐ Yes	☐ No	☐ Maybe
d. With friends	☐ Yes	☐ No	☐ Maybe
e. With family	☐ Yes	☐ No	☐ Maybe
f. Men only	☐ Yes	☐ No	☐ Maybe
g. Women only	☐ Yes	☐ No	☐ Maybe
h. No preference	☐ Yes	☐ No	☐ Maybe
6. Where would you like to exercise? (check as many as apply)			
a. At home	☐ Yes	☐ No	☐ Maybe
b. At a community fitness centre	☐ Yes	☐ No	☐ Maybe
c. At a cancer fitness centre	☐ Yes	☐ No	☐ Maybe
d. No preference	☐ Yes	☐ No	☐ Maybe
7. What time of day would you like to exercise? (check as many as apply)			
a. Morning	☐ Yes	☐ No	☐ Maybe
b. Afternoon	☐ Yes	☐ No	☐ Maybe
c. Evening	☐ Yes	☐ No	☐ Maybe

d. No preference	☐ Yes	☐ No	☐ Maybe
8. What type of physical activities do you prefer? (check as many as apply)			
a. Walking	☐ Yes	☐ No	☐ Maybe
b. Swimming	☐ Yes	☐ No	☐ Maybe
c. Yoga	☐ Yes	☐ No	☐ Maybe
d. Cycling	☐ Yes	☐ No	☐ Maybe
e. Aerobics	☐ Yes	☐ No	☐ Maybe
f. Others	☐ Yes	☐ No	☐ Maybe
9. When would you prefer to start an exercise program?			
a. Before treatment	☐ Yes	☐ No	☐ Maybe
b. During treatment	☐ Yes	☐ No	☐ Maybe
c. 3-6 months after treatment	☐ Yes	☐ No	☐ Maybe
d. At least 1 year after treatment	☐ Yes	☐ No	☐ Maybe
10. What intensity (how hard) would you like your exercise program to be?			
a. Low intensity (very light)	☐ Yes	☐ No	☐ Maybe
b. Moderate intensity	☐ Yes	☐ No	☐ Maybe
c. High intensity (strenuous)	☐ Yes	☐ No	☐ Maybe
d. No preference	☐ Yes	☐ No	☐ Maybe
11. Why types of activities would you like to perform?			
a. Same at each session	☐ Yes	☐ No	☐ Maybe
b. Different activities at each session	☐ Yes	☐ No	☐ Maybe
12. How would you prefer to perform these exercises?			
a. Supervised/flexible	☐ Yes	☐ No	☐ Maybe
b. Unsupervised/self-paced	☐ Yes	☐ No	☐ Maybe
13. How would you prefer the structure of your exercise program?			
a. Spontaneous/flexible	☐ Yes	☐ No	☐ Maybe
b. Scheduled (i.e., specific days/times)	☐ Yes	☐ No	☐ Maybe

The survey continues on the next page.

Your Health and Well-Being

This survey 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. ***Thank you for completing this survey!***

For each of the following questions, please mark an ☒ in the one box that best describes your answer.

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

Excellent	Very good	Good	Fair	Poor
▼	▼	▼	▼	▼
☐1	☐2	☐3	☐4	☐5

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

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐1	☐2	☐3
b Climbing several flights of stair	☐1	☐2	☐3

3. During the <u>past week</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a <u>Accomplished less</u> than you would like	☐1	☐2	☐3	☐4	☐5
b Were limited in the <u>kind</u> of work or other activities	☐1	☐2	☐3	☐4	☐5

4. During the <u>past week</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (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 <u>Accomplished less</u> than you would like	☐1	☐2	☐3	☐4	☐5
b Did work or other activities <u>less carefully than usual</u>	☐1	☐2	☐3	☐4	☐5

5. During the <u>past week</u>, 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
☐1	☐2	☐3	☐4	☐5

6. These questions are about how you feel and how things have been with you <u>during the past week</u>. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the <u>past week</u>…

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Have you felt calm and peaceful?	☐1	☐2	☐3	☐4	☐5
b. Did you have a lot of energy?	☐1	☐2	☐3	☐4	☐5
c. Have you felt downhearted and depressed?	☐1	☐2	☐3	☐4	☐5

7. During the <u>past week</u>, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities (like visiting with friends, relatives, etc.)?

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

This survey continues on the next page.

QUALITY OF LIFE

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

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

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

GS7	I am satisfied with my sex life	0	1	2	3	4

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

	EMOTIONAL WELL-BEING	**Not at all**	**A little bit**	**Some-what**	**Quite a bit**	**Very much**
GE1	I feel sad	0	1	2	3	4
GE2	I am satisfied with how I am coping with my illness	0	1	2	3	4
GE3	I am losing hope in the fight against my illness	0	1	2	3	4
GE4	I feel nervous	0	1	2	3	4
GE5	I worry about dying	0	1	2	3	4
GE6	I worry that my condition will get	0	1	2	3	4

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

GF7	I am content with the quality of my life	0	1	2	3	4

DEMOGRAPHIC INFORMATION

1. Please indicate your age: _____

2. How would you describe yourself: (please check one)

☐Aboriginal
☐Arab/West Asian
☐Black
☐Caucasian
☐Chinese
☐Filipino
☐Japanese
☐Korean
☐Latin America
☐South Asian
☐Southeast Asian
☐Other:
_____

3. Please indicate the highest level of education that you have completed: (please check one)

☐ Some high school ☐ Some university/college ☐ Some graduate school
☐ Completed high school ☐ Some technical school ☐ Completed technical school
☐ Completed university/college ☐ Completed graduate school

4. Please indicate your current level of household income: (please check one)

☐Less than $20,000
☐$20,000-$39,999
☐$40,000-69,999
☐$70,000 or more
☐Do not wish to say

5. What is your current employment status? Please choose the **one** that best describes your current situation. If you are self-employed, choose full-time or part-time as appropriate.

☐ Working in paid job full-time (30 or more hours per week)
☐ Working in a paid job part-time (Less than 30 hours per week)
☐ Unemployed
☐ Unable to work because of sickness or disability
☐ Looking after home and/or family
☐ Student
☐ Retired
☐ Doing unpaid or voluntary work

7. Please provide your current residential address (address, city, postal code):

_____

Appendix F: **Opt-out Form**

Participant ID#_____

PHYSICAL ACTIVITY AND GYNAECOLOGIC CANCER IN NOVA SCOTIA STUDY OPT-OUT FORM

Dear Participant,

We recognize that participating in research can be time consuming and is not convenient or possible for everyone. While we do greatly appreciate participation in this study, we acknowledge this challenge and would like to ensure that we do not inconvenience you further.

As Phase I of this study involves mailing of surveys and survey reminders, we would like to know if you do not wish to participate in this study. Please complete the lower portion of this page and return this page in the stamped and addressed envelope that was provided in this package. If you are a family member/care giver of the participant and do not foresee their involvement in this study to be suitable or possible, please complete the lower portion of this page and return this page in the stamped and addressed envelope that is provided in this package.

Sincerely yours,

Ashley Tyrrell

IF YOU DO NOT WISH TO PARTICIPATE IN THIS STUDY, PLEASE CHECK ONE OF THE FOLLOWING AND RETURN THIS PAGE IN THE STAMPED, SELF-ADDRESSED ENVELOPE PROVIDED

Participant

☐ **I do not wish to participate in this study and I would not like to receive future correspondences.**

OR

On-behalf of Participant

☐ **The participant is not able to participate in this study and would not like to receive any future correspondences**

Relationship: _____

***Appendix G*: Postcard Reminder**

Capital Health

SURVEY REMINDER

Physical Activity and Gynecologic Cancer in Nova Scotia: A Comparison of Objective and Self-Report Physical Activity and Their Association with Quality of Life

This is just a reminder to ask for your support in completing the physical activity survey that you recently received in the mail. If you have already completed and returned the package, we would like to **thank you** *for your support of this project.*

Should you have any concerns on how you were identified as a potential study participant, please contact Rosalee Walker, research assistant, (Nova Scotia Cancer Registry) at 902-473-3494 or toll free at 1-800-599-2267.

Should you have any questions regarding the study, please do not hesitate to contact Ashley Tyrrell at (902) 489-1656 or via email at tyrrellashley@gmail.com or contact her supervisor Dr. Melanie Keats at (902) 494-7173 or via email at Melanie.Keats@Dal.ca.

Capital Health

AppendixH: Phase II Consent Form

PHASE II: PARTICIPANT CONSENT FORM

Study Title:	Physical Activity and Gynaecologic Cancer Survivors in Nova Scotia
Principal Investigator:	Ashley Tyrrell, B.P.H.E, B.Sc M.A. Candidate, Health Promotion DalhousieUniversity Phone: (902) 489-1656 E-mail: Ashley.Tyrrell@dal.ca
Thesis Supervisor:	Dr. Melanie Keats, PhD Assistant Professor, Health and Human Performance DalhousieUniversity Phone: (902) 494-7173 E-mail: melanie.keats@dal.ca
Associate Investigators:	Please see the attached Research Team Contact Page for a full list of the investigators for this study

PART A.

1. Introduction

You are invited to take part in a research study. Taking part in this study is voluntary. It is up to you to decide whether to be in the study or not. Before you decide, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

Please read this carefully. Take as much time as you like. If you like, take it home to think about for a while. Mark anything you don't understand, or want explained better. After you have read it, please ask questions about anything that is not clear.

The researchers will:

- Discuss the study with you
- Answer your questions
- Keep confidential any information which could identify you personally
- Be available during the study to deal with problems and answer questions

We do not know if taking part in this study will help you. You may feel better. On the other hand it might not help you at all. It might even make you feel worse. We cannot always predict these things. We will always give you the best possible care no matter what happens.

If you decide not to take part or if you leave the study early, your usual health care will not be affected.

PART B.

2. Why Is This Study Being Done?

Physical activity is an important health behaviour for cancer survivors. Physical activity has been shown as possibly having a role in improving the quality of life of cancer survivors. A limited amount of research, however, has used measures of 'actual' physical activity behaviours to collect their physical activity information. These measures are also known as objective measures of physical activity and include tools such as such as step counters or motion sensors. In an effort to contribute to our understanding of physical activity behaviours of gynaecologic cancer survivors this study will compare objectively measured physical activity via accelerometers (digital physical activity monitors) with physical activity data measured by a questionnaire. Accelerometers are similar to pedometers or step counters, as they are able to measure amount of activity, but they are also able to record how hard you are working. Accelerometers will be compared with the questionnaire data to determine how various activity levels relate to quality of life.

3. Why Am I Being Asked To Join This Study?

Within Phase I of this study, you indicated that you were interested in participating in Phase II of this study and resided within the HalifaxRegionalMunicipality.

4. How Long Will I Be In The Study?

This study is in two phases. In Phase II, you will be asked to wear an accelerometer for nine days from morning until night (with the exception of showering or water-based activities). You will also be asked to complete a one-time, pen and paper survey (approximately 30 minutes) and a short face-to-face interview (approximately 15-20 minutes).

5. How Many People Will Take Part In This Study?

This study is taking place only in Nova Scotia. The study is voluntary in nature but limited to participants that live in the HalifaxRegionalMunicipality. We hope to recruit a minimum of 20 patients for this Phase of the study.

6. How Is The Study Being Done?

Phase II of the study uses accelerometers and self-report questionnaires. You will meet with the principle investigator and will receive both an accelerometer and a questionnaire. You will be asked to wear the devices for nine consecutive days. After the nine days, you will be asked to complete the questionnaires. A second meeting with the primary researcher will occur in which the accelerometers and completed questionnaires will be returned. At this time, you will be asked to participate in a short (15-20 minute) interview regarding their physical activity interests and preferences.

7. What Will Happen If I Take Part In This Study?

After initial contact, and screening for eligibility criteria, a face-to-face meeting with participants will be scheduled at a location of your convenience. The initial meeting will take approximately one (1) hour. At this meeting, you will be outfitted with an accelerometer and instructions on how to use the device, as well as being provided with a second study pack. You will be asked to wear the accelerometer continuously for nine consecutive days (i.e., from the time that you wake up until the time you go to bed). You will also be asked to complete the contents of the study pack on the ninth day of your data collection. A second meeting will be arranged between you and the primary investigator in which you will be required to return the study pack contents and the accelerometer. During this meeting, you will also be asked to participate in a short interview (about 15-20 minutes) in which you will be asked to respond to questions regarding your interest in physical activity programs and preference of physical activities. This interview may be audio recorded upon your agreement.

8. Are There Risks To The Study?

There is minimal risk involved in participating in this study. You will be asked to wear an accelerometer for nine consecutive days. You will also be asked to complete a survey about your physical activity levels and your quality of life or well-being, and an interview about your physical activity preferences. If the accelerometer is causing you discomfort you are free to remove it during uncomfortable activities, or you are free to choose to not take part. It is important to emphasize that you will only be asked to share information that you feel comfortable sharing. You may find the questionnaires you receive during the course of the study upsetting or distressing. You may not like all of the questions that you will be asked. If you are uncomfortable responding to any of the questions you can leave them blank or you are free to choose to not take part. Should you find during the study that you need additional emotional support the research team would strongly encourage you to return to your physician to receive the needed care.

Although the research staff will make every effort to ensure your safe participation, there may be the possibility of unforeseen harms.

9. What Happens at the End of the Study?

At the end of the study the results will be presented at various conferences, within the community and potentially published. The final study results can be available to you once

the study is completed and reported. The results will be mailed to you if you want to receive them. You will be asked to check the last page of this form indicating if you wish to receive a summary of the results of the study.

10. What Are My Responsibilities?

As a study participant you will be expected to:

- Attend 2 meetings with the primary investigator to receive and return the accelerometer and the study pack
- Wear the accelerometer for 9 days
- Complete survey

11. Can I Be Taken Out Of The Study Without My Consent?

Yes. You may be taken out of the study at any time, if:

- There is new information that shows that being in this study is not in your best interests.
- The Capital Health Research Ethics Board or the Principal Investigator decides to stop the study.

You will be told about the reasons why you might need to be taken out of the study.

12. What About New Information?

It is possible (but unlikely) that new information may become available while you are in the study that might affect your health, welfare, or willingness to stay in the study. If this happens, you will be informed in a timely manner, and will be asked whether you wish to continue taking part in the study or not.

13. Will It Cost Me Anything?

<u>Compensation</u>

You will not be paid to be in this study.

<u>Research Related Injury</u>

If you become ill or injured as a direct result of participating in this study, necessary medical treatment will be available at no additional cost to you. Your signature on this form only indicates that you have understood to your satisfaction the information regarding your participation in the study and agree to participate as a subject. In no way does this waive your legal rights nor release the Principal Investigator, the research staff, the study sponsor or involved institutions from their legal and professional responsibilities.

14. What About My Right To Privacy?

Protecting your privacy is an important part of this study. If you decide to participate in the study, the principle investigator will be given copies of the consent form which will contain your name. While your name will appear on these forms, your name will not be recorded on any study related information. All of the information will be recorded using a unique coding number that will not identify you by name. Your name will not appear in any report or article as a result of this study.

All questionnaires collected from this study will be kept in a locked cabinet in Dr. Melanie Keats's faculty office in the Dalplex for 7 years after the publication of the results from the study, at which point all physical and electronic data from this study will be destroyed.

Access and Use of Records

The research team will not access or collect any data from your personal health records.

15. What if I Want to Quit The Study?

If you chose to participate and later change your mind, you can say no and stop the research at any time. If you wish to withdraw your consent please inform the Principal Investigator. All data collected up to the date you withdraw your consent will remain in the study records, to be included in study related analyses. *A decision to stop being in the study will not affect your medical care or treatment.*

16. Declaration of Financial Interest

The Principal Investigator has no financial interests in conducting this research study.

17. What About Questions Or Problems?

For further information about the study call Ashley Tyrrell. Ashley Tyrrell is in charge of this study at this institution (she is the "Principal Investigator"). Ashley Tyrrell's telephone number is (902) 489-1656. If you can't reach the Principal Investigator, please refer to the attached Research Team Contact Page for a full list of the people you can contact for further information about the study.

The Principal Investigator is Ashley Tyrrell

Telephone: (902) 489-1656 or Ashley.Tyrrell@dal.ca

The Student's Supervisor is Dr. Melanie Keats

Telephone: (902) 494-7173 or melanie.keats@dal.ca

18. What Are My Rights?

After you have signed this consent form you will be given a copy.

If you have any questions about your rights as a research participant, contact the Patient Representativeat(902) 473-2133.

In the next part you will be asked if you agree (consent) to join this study. If the answer is "yes", you will need to sign the form.

PART C.

19. PHASE II: Consent Form Signature Page

I have reviewed all of the information in this consent form related to the study called:

Physical Activity and Gynaecologic Cancer Survivors in Nova Scotia

I have been given the opportunity to discuss this study. All of my questions have been answered to my satisfaction.

This signature on this consent form means that I agree to take part in this study. I understand that I am free to withdraw at any time.

_____	_____	_____ / _____ / ___
Signature of Participant	Name (Printed)	Year Month Day*
_____	_____	_____ / _____ / ___
Witness to Participant's Signature	Name (Printed)	Year Month Day*
_____	_____	_____ / _____ / ___
Signature of Investigator	Name (Printed)	Year Month Day*
_____	_____	_____ / _____ / ___
Signature of Person Conducting Consent Discussion	Name (Printed)	Year Month Day*

**Note: Please fill in the dates personally*
***I have had a discussion with the Participant named above and can verify that the participant understands the nature of the study and their participation: Initials*_____

□ I give my permission to have my interview with the researcher audiotaped (please sign on the line provided) _____

□ I do not give my permission to have my interview with the researcher audiotaped.

I Will Be Given A Signed Copy Of This Consent Form

Thank you for your time and patience!

RESEARCH TEAM CONTACT PAGE

TRIAL/STUDY TITLE	TRIAL/STUDY SPONSOR
PHYSICAL ACTIVITY AND GYNAECOLOGIC CANCER IN NOVA SCOTIA: A COMPARISON OF OBJECTIVE AND SELF-REPORT PHYSICAL ACTIVITY AND THEIR ASSOCIATION WITH QUALITY OF LIFE	**N/A**

Name	Role	Work Address	Telephone Number	E-Mail Address
Ms. Ashley Tyrrell	Principal Investigator	School of Health and Human Performance, DalhousieUniversity 6230 South Street	(902) 489-1656	Ashley.Tyrrell@dal.com
Dr. Melanie Keats	Supervisor/Co-Principal Investigator	School of Health and Human Performance, DalhousieUniversity 6230 South Street	(902) 473-7173	Melanie.Keats@dal.ca
Dr. Chris Blanchard	Co-Investigator	QEII Health Sciences Centre Centre for Clinical Research 5790 University Avenue	(902) 473-3789	Chris.blanchard@dal.ca
Dr. Louise Parker	Co-Investigator	Atlantic Path 1494 Carlton Street	(902) 494-3566	louise.parker@iwk.nshealth.ca

Appendix I: Phase II Study Pack

Participant ID#_____

LESIURE-TIME PHYSICAL ACTIVITY QUESTIONNAIRE

The following portion of the questionnaire will ask you to recall your *average weekly* level of physical activity *over the past seven days (ONE WEEK)*.

When answering the following questions, please remember to:

- **Consider your average over the past week.**
- **Only count activity/exercise sessions that lasted *10 minutes or longer.***
- **Only include exercise/activity that you do in your *leisure/free time.***
- **Please record the average duration or time that you performed each activity**.

Please record a number in each of the space provided. If you did no activity, then please record a '0'

A: STRENUOUS ACTIVITY (heart beats rapidly, sweating)
(i.e., running, jogging, hockey, football, soccer, squash, cross country, skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous aerobics classes, heavy weight training, laser tag)

During the past week, I was involved in *strenuous activities* _____ times/week for an average duration of _____ minutes each session.

B: MODERATE ACTIVITY (not exhausting, light perspiration)
(i.e., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and line dancing, leisure skating)

During the past week, I was involved in *moderate activities* _____ times/week for an average duration of _____ minutes each session.

C: MILD ACTIVITY (minimal effort, no perspiration)
(i.e., easy walking, yoga, archery, fishing, bowling, horseshoes, golf, darts, Frisbee)

During the past week, I was involved in *mild activities* _____ times/week for an average duration of _____ minutes each session.

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

8. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

9. How much time did you usually spend doing vigorous physical activities on one of those days?

   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

10. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

    _____ **days per week**

    ☐ No moderate physical activities → ***Skip to question 5***

11. How much time did you usually spend doing moderate physical activities on one of those days?

_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

13. How much time did you usually spend walking on one of those days?

_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

14. During the last 7 days, how much time did you spend sitting on a week day?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

This survey continues on the next page.

EXERCISE PREFERENCES

We each have our own reasons for being or not being physically active. In an effort to better develop programs that meet your individual needs, it is important to know whether or not you are interested in physical activity and if so, what types of activities you prefer, where you like to exercise, and how hard you like to exercise. The following questions will help us better understand your needs.

1. Did you receive any exercise/physical activity counselling following your diagnosis?	☐ Yes	☐ No	☐ Unsure
2. Would you have liked to have received some form of exercise/physical activity counselling following your diagnosis?	☐ Yes	☐ No	☐ Maybe
3. Would you be interested in participating in an exercise/physical activity program designed for cancer survivors?	☐ Yes	☐ No	☐ Maybe
4. Would you be able to participate in an exercise/physical activity program designed for cancer survivors?	☐ Yes	☐ No	☐ Maybe
5. Who would you like to exercise with? (check as many as apply)			
a. Alone	☐ Yes	☐ No	☐ Maybe
b. With other cancer survivors (same cancer)	☐ Yes	☐ No	☐ Maybe
c. With other cancer survivors (any cancer)	☐ Yes	☐ No	☐ Maybe
d. With friends	☐ Yes	☐ No	☐ Maybe
e. With family	☐ Yes	☐ No	☐ Maybe
f. Men only	☐ Yes	☐ No	☐ Maybe
g. Women only	☐ Yes	☐ No	☐ Maybe
h. No preference	☐ Yes	☐ No	☐ Maybe
6. Where would you like to exercise? (check as many as apply)			
a. At home	☐ Yes	☐ No	☐ Maybe
b. At a community fitness centre	☐ Yes	☐ No	☐ Maybe
c. At a cancer fitness centre	☐ Yes	☐ No	☐ Maybe
d. No preference	☐ Yes	☐ No	☐ Maybe
7. What time of day would you like to exercise? (check as many as apply)			
a. Morning	☐ Yes	☐ No	☐ Maybe
b. Afternoon	☐ Yes	☐ No	☐ Maybe
c. Evening	☐ Yes	☐ No	☐ Maybe

d. No preference	☐ Yes	☐ No	☐ Maybe
8. What type of physical activities do you prefer? (check as many as apply)			
a. Walking	☐ Yes	☐ No	☐ Maybe
b. Swimming	☐ Yes	☐ No	☐ Maybe
c. Yoga	☐ Yes	☐ No	☐ Maybe
d. Cycling	☐ Yes	☐ No	☐ Maybe
e. Aerobics	☐ Yes	☐ No	☐ Maybe
f. Others	☐ Yes	☐ No	☐ Maybe
9. When would you prefer to start an exercise program?			
a. Before treatment	☐ Yes	☐ No	☐ Maybe
b. During treatment	☐ Yes	☐ No	☐ Maybe
c. 3-6 months after treatment	☐ Yes	☐ No	☐ Maybe
d. At least 1 year after treatment	☐ Yes	☐ No	☐ Maybe
10. What intensity (how hard) would you like your exercise program to be?			
a. Low intensity (very light)	☐ Yes	☐ No	☐ Maybe
b. Moderate intensity	☐ Yes	☐ No	☐ Maybe
c. High intensity (strenuous)	☐ Yes	☐ No	☐ Maybe
d. No preference	☐ Yes	☐ No	☐ Maybe
11. Why types of activities would you like to perform?			
a. Same at each session	☐ Yes	☐ No	☐ Maybe
b. Different activities at each session	☐ Yes	☐ No	☐ Maybe
12. How would you prefer to perform these exercises?			
a. Supervised/flexible	☐ Yes	☐ No	☐ Maybe
b. Unsupervised/self-paced	☐ Yes	☐ No	☐ Maybe
13. How would you prefer the structure of your exercise program?			
a. Spontaneous/flexible	☐ Yes	☐ No	☐ Maybe
b. Scheduled (i.e., specific days/times)	☐ Yes	☐ No	☐ Maybe

The survey continues on the next page.

Your Health and Well-Being

This survey 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. ***Thank you for completing this survey!***

For each of the following questions, please mark an ☒ in the one box that best describes your answer.

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

Excellent	Very good	Good	Fair	Poor
▼	▼	▼	▼	▼
☐1	☐2	☐3	☐4	☐5

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

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐1	☐2	☐3
b Climbing several flights of stairs	☐1	☐2	☐3

3. During the <u>past week</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a <u>Accomplished less</u> than you would like	☐1	☐2	☐3	☐4	☐5
b Were limited in the <u>kind</u> of work or other activities	☐1	☐2	☐3	☐4	☐5

4. During the <u>past week</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (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 <u>Accomplished less</u> than you would like	☐1	☐2	☐3	☐4	☐5
b Did work or other activities <u>less carefully than usual</u>	☐1	☐2	☐3	☐4	☐5

5. During the <u>past week</u>, 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
☐1	☐2	☐3	☐4	☐5

6. These questions are about how you feel and how things have been with you <u>during the past week</u>. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the <u>past week</u>…

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Have you felt calm and peaceful?	☐1	☐2	☐3	☐4	☐5
b. Did you have a lot of energy?	☐1	☐2	☐3	☐4	☐5
c. Have you felt downhearted and depressed?	☐1	☐2	☐3	☐4	☐5

7. During the <u>past week</u>, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities (like visiting with friends, relatives, etc.)?

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

This survey continues on the next page.

QUALITY OF LIFE

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

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

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

GS7	I am satisfied with my sex life	0	1	2	3	4

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

	EMOTIONAL WELL-BEING	**Not at all**	**A little bit**	**Some-what**	**Quite a bit**	**Very much**
GE1	I feel sad	0	1	2	3	4
GE2	I am satisfied with how I am coping with my illness	0	1	2	3	4
GE3	I am losing hope in the fight against my illness	0	1	2	3	4
GE4	I feel nervous	0	1	2	3	4
GE5	I worry about dying	0	1	2	3	4
GE6	I worry that my condition will get	0	1	2	3	4

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

Appendix J: Interview Guide

Before the interview:

- Collect the accelerometer equipment and load it onto the computer
- Collect completed study pack
- Ask the participants if they have any questions before the interview begins
- Check the recorder
- Start the interview

Script:

We each have our own reasons for being or not being physically active. In an effort to better develop programs that meet your individual needs I will be asking you questions about whether or not you are interested in physical activity and if so, what types of activities do you prefer, where do you like to exercise, and how hard you like to exercise. The following questions will help us better understand your needs. There are no 'right' or 'wrong' answers so please just answer the questions to the best of your ability and only answer questions that you feel comfortable with asking.

1. Did you receive any exercise/physical activity counselling following your diagnosis?
    a. Probes-Yes:
        i. Who provided you with this counselling?
        ii. Where did you receive this counselling?
        iii. What information did they provide?
    b. Probes-No:
        i. Would you have liked to have received some form of exercise/physical activity counselling following your diagnosis?
        ii. From who and where?
        iii. What information would you have liked to receive?

2. Would you be interested in participating in an exercise/physical activity program designed for cancer survivors?
    a. Probes-Yes:
        i. What interests you about a program like this? (prompts: social activity, energy, support)
    b. Probes-No:
        i. Why wouldn't a program like this interest you?

3. Would you be able to participate in an exercise/physical activity program designed for cancer survivors?
    a. Probes-Yes:
        i. What factors make you able to participate? (prompts: family, time, money, energy)
        ii. What factors may hinder or interrupt your participation? (prompts: family, time, money, energy)

b. Probes-No:
    i. What factors hinder your ability to participate? (prompts: family, time, money, energy)
    ii. Do you think your ability to take part in this type of program could change? Why or why not?

4. What type of program would be of most interest to you?
    a. Who would you prefer to exercise with? (prompts: alone, family, friends, other cancer survivors, no preference)
        i. Probes: What make this your first choice?
    b. Where would you prefer to exercise? (prompts: at home, community center, no preference)
        i. Probes: What makes this an attractive environment for exercising? (prompts: convenience, nature, out of the house)
    c. Would you prefer to have supervised or unsupervised exercise sessions?
        i. Probes: Why
    d. How would you like to have your exercise program set up? (prompts: scheduled sessions, flexible times)
    e. What time of day would you prefer to exercise (prompts: morning, afternoon, evening)
        i. Probes: What makes this time of day attractive for exercising?
    f. What types of activities would you like to perform? (prompts: walking, swimming, no preference)
        i. Would you want the activities to stay the same or change?
        ii. At what intensity would be best for these activities?

5. When would you prefer to start an exercise program? (prompts: before, during, after treatment)
    a. Probes: Why would exercise fit in this time period?